Advanced Ideas Mechanics

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Harvest

Time Table for Chapter 1 System Context

Week	Activity	Comments
1		
2		
3	17-02-20: Start Meeting 20-02-2020: Brainstorming Session 24-02-2020: Hand-in concept version chapter 1	A brief discussion of the project title.

Revision History

Date	Version	Description
24-02-2020	1.0	• Ali: Chapter 1.1 Brainstorming the Project Topic (1.5 Hours) • Sydwell: Chapter 1.1 Current Situation (1 Hour) • Nancy: Chapter 1.2 Future Situation (1.5 Hours) • Teboho: Chapter 1.2 Future Situation (1.5 Hours) • Samkelo: Chapter 1.3 Challenges (1 Hour)

Time Table for Chapter 2 Business Vision

Week	**Activity**	**Comments**
4		
5		
6	10-03-20: Start Meeting 12-03-2020: Brainstorming Session 14-02-2020: Hand-in concept version chapter 2	A brief discussion of the project plan.

Revision History

Date	Version	Description
14-03-2020	2.0	• Ali: Chapter 2.1 (2 Hours) • Sydwell: Chapter 2.2 – 2.3(3 Hour) • Nancy: Chapter 2.4 – 2.5 (2 Hours) • Teboho: Chapter 2.6 Future Situation (2Hours) • Samkelo: Chapter 2.7.4 – 2.8 Challenges (3 Hour)

Timetable for Project Management Plan

Week	Activity	Comments
7		
8		
9	10-03-20: Start Meeting 12-03-2020: Brainstorming Session 14-02-2020: Hand-in concept version chapter 2	A brief discussion of the project plan.

Revision History

Date	Version	Description
14-03-2020	2.0	• Ali: Chapter 1 (2.5 Hours) • Sydwell: Chapter 4 Current Situation (2 Hour) • Nancy: Chapter 2 Future Situation (2.5 Hours) • Tebogo: Chapter 3 Future Situation (2.5 Hours) • Samkelo: Chapter 5 Challenges (3 Hour)

Timetable for Chapter 3 Architectural Vision

Week	Activity	Comments
10.	25-03-20 : Work distribution meeting	A division of the contents of documentation 3.0 to each group member.
11.	02-04-20 : Progress report	Group members report on how far they are with their work.
12.	10-04-20 : Section submission	Each group member submits their work.

Revision History

Date	Version	Description
15-04-20	3.0	• Ali: Chapter 3.3 Key drivers(1.5 Hours) • Sydwell: Chapter 3.5 Functional Requirements (2 Hours) • Nancy: Chapter 3.2 Stakeholders and their concerns (2 Hours) • Teboho: Chapter 3.4 Stories and use-cases (2.5 Hours) • Samkelo: Chapter 3.1 Architectural vision (2 Hour)

Time Table for Chapter 4 System Design Document

Week	Activity	Comments
13	23-07-20: Start Meeting	The team met with Ms Matyila (via Zoom) to assess how far we were with the design and implementation of our project.
14	27-07-20: Brainstorming session	The team met to discuss the roles for implementation and the documentation for the project.
15	31-07-20: Project progress meeting	The team met to check on progress on the documentation and implementation and to discuss any hinders we might have encountered.
16	07-08-20: Project progress meeting.	Team members were advised to familiarise themselves with ML Kit, and team leader checked on the progress.
17	17-08-20: Project progress meeting.	Weekly team meeting to check on progress.
18	18-08-20: Project progress meeting	The team finalised the documentation of the software requirements specification.

Software Development Timetable

Date	Activity	Comments
03-07-20 to 06-07-20	Layout Design	We used Adobe XD to design the system interface. Team members contribution on design. • Ali – Login Screen • Samkelo – Registration • Teboho – Forgot Password • Sydwell – Dashboard • Nacy – Survey Activity
07-07-20 to 09-07-20	Login and Registration	The team met to code the login and registration activity.
10-07-20 to 23-07-20	Dashboard Activity and Inner Screens	The team met to code the dashboard and inner navigating screens.

Revision History

Date	Version	Description
05 – 07-20	4.0	• Teboho: Section 4.1 Revision History (2 Hours) • Sydwell Section 4.2 System Overview (2 Hours) • Ali and Samkelo Section 4.3 Hardware Design (2Hours) • Nancy Section 4.4 Data and Database/Files (2 hours) • System Interfaces Whole Team Effort (2 Weeks)

Table of Contents

CHAPTER 1

System context

This project is about the development of a software architecture that will assist potential farm owners discover new arable plots of farm land. In this introduction we will discuss the current situation, the future situation and the challenges ahead.

1.1 Current Situation

Based on our observations and research conducted in partnership with various farmers, we have identified that the global population is increasing at an exponential rate, whilst a majority of societies are struggling in terms of their food supply and security. One of the most crucial trends and factors we studied suggest that the number of people in the world is growing rapidly, but the number of sustainable farms to constantly supply them with food is not growing, thriving nor projected as expected. In other parts of the world there is a complete decline in farming activities altogether in regard to food production.

South Africa, as one of the developing and emerging countries is thus facing the very same and dire situation. Some farms are closing down due to exhaustion, because of environmental issues that were not carefully studied nor monitored before farming activities commenced in those particular and designated areas. Investors are not supporting potential farmers enough because farming is too risky and also the production of low quality crop yields nowadays.

1.2 Future Situation

The system we are suggesting and proposing incorporates Artificial Intelligence technology to help potential farmers to do a careful analysis of the land and environment they wish to farm on, and also track the environmental factors affecting it. Based on the input the user provides the system, it will look at the provided attributes and factors to determine if the land is good enough for farming as well as contrast it with historical data. The application and/or website will receive user input and do a careful analysis to provide the user with feedback of whether the particular environment is ideal for farming and so on.

The user will input the soil type, the soil colour, soil acidic (pH) levels, the area's humidity, the area's average rainfall, average temperature etc. and the system will compare the input with results taken in other areas to determine if the area is good enough for farming, cultivation and/or gardening. We are hoping to help existing enterprises and new farm owners to efficiently discover new plots of arable and cultivatable land that is or remains unused. With the system, potential farm owners can make safe investments by investing in areas that are assured to be productive and will make them profit. The system will save farm owners and gardeners the tedious work of examining an area before or during farming activity commences. In the case of food security, the more land that will be discovered, the better the chances of addressing the issue of food security in our society.

1.3 Challenges

The Harvest system will face a number of future challenges. The system will have to make accurate predictions using soil samples, weather reports, the preferred location and other major environmental factors. Some other main challenges include:

- The system's accuracy.
- Predicting the effects of climate change.
- Predicting sudden weather changes.
- Delivering the fully functional system on time.

The data provided by the datasets will have to ensure the system makes accurate predictions and deal with most of these challenges efficiently.

CHAPTER 2

2.1. Business Vision

Our main task is to conveniently combine all of the information about your field in one place, to identify and draw the attention of farmers to problem areas. To achieve this, we collect data from different sources namely satellite images, weather data, soil types, vegetation maps, among others and supplement it with our own developments. After having analysed the data obtained, the system notifies the user of possible risks and changes to be expected, provides the ability to cluster fields and treat them accordingly, as well as predict results. In the long run the system will allow for optimal resource utilization and effective decision making. Our goal is to create a point of communication between the farmers and their crops.

- **Key functions**.
    - Live images of the crops in the farm.
    - Notifications should there be any abnormal changes in the farm.
    - Live weather coverage from the farm.
    - Water stress determination.
    - Up to date of information on the current stage of crop growth.
    - Detailed soil type mapping.

- **Benefits for farmers.**

- The fastest way to learn about changes in the field.
- Access to historical data on vegetation in the selected area.
- Accurate weather forecast.
- Weather risks alerts.
- Recommendations on planting times and crop selection.
- Crop harvest prediction.

Advantages and disadvantages of the current system.

Some of the advantages of the current system used is that it brings precision in crop monitoring which in turn, helps in the increase in food supply (however this new technology is not used to its optimum level). But there is the chance where the current smart farming require certain skills sets particular in order to understand and operate the equipment. While the use of these technologies is impressive, it does incur a lot of costs. Most of the systems being used today are not altered according to the level of the farmers, hence it takes a lot of money to transform them. Having witnessed a severe drought in the Western Cape recently, which had an impact in the production of food, this shows that the current system for most farmers was unable to detect and notify the farmers in time to prepare for it.

2.2. The business rationale

Most people and potential farmers tend to choose, farm or purchase land that is not sustainable farming and with fact that the South African population is growing at a rapid pace, therefore our system is the only one to provides proper analysis on types of soil, water supply around the area, types of crops to be planted, weather conditions and etc.

2.3. Product description and its evolution over time

Our system actually involves AI (Artificial Intelligence) which states that it will have human capabilities, self-detection and perform all activities which were supposed to be do manually by different types of specialists such as land, water surveyors and etc. for organizations and potential farmers to get what they desire. The system will notify and give detailed information about land based on data previously taken.
Our main target is large, small farming organizations and potential farmers who would like to start farming with the need to find proper and desirable places for farming.

The firm will be able to compete in the market since it will only focus on farming in a sense that it is monopolized and which means that there are no competitors and that will lead to many consumers and high demand for the services and with the fact that services will be provided at low and reasonable prices.

Provision of full-time services and qualified personnel will be hired for system maintenance, updates and error fixing where necessary.

2.4. Target audience

Is intended mainly for practitioners working for extension services, governmental agencies, non-governmental organizations or farmer associations. It will also be useful to scientists and as a training and education tool on the role of water in determining crop productivity.

- Commercial Farmers

These farmers are involved in primary production, they meet the economic unit, and they trade profitably and have secured markets with evident potential to expand operation to increase profits. These farmers can be land reform beneficiaries, co-operatives or private entities.

- Distressed farmers

Farmers who are experiencing challenges in meeting their financial obligations, i.e. loan repayments, or operational experience to sustain the farm. Farmers can be land reform beneficiaries or private clients.

- Emerging farmers

Emerging farmers are those who are keen on agricultural activities and/or in need of support, advice and guidance on the start-up processes. For primary level production planning, the farmer will be referred to the Department of Agriculture and Rural Development (DARD). For the assessment of the farm, farmers would be required to liaise with the extension officers from the DARD in their districts for the initial assessment of the farm.

- Young farmers

These farmers are young people between the ages of 18-35, who own farms as co-operatives or private entities.

2.5. Business or domain model

2.6. Roadmap about market development

The primary target market as identified by the marketing strategy are potential farm owners, home owners, agricultural and any common individuals interested in farming or procuring land for farming.

The first action plan on the marketing strategy is to advertise the product to the above-mentioned target audience through the various media and information sharing outlets. This will all take place before the official product launch. The group will distribute posters and brochures online and in designated areas in person. The posters will outline who we are as a group or organization, what is it that we do and it will also offer more details about the product.

Secondly the group will announce the official launch date and invite all the important stake holders to be part of the product's official launch. Invitations will be sent out to all key stakeholders, they will provide brief details about the organization, the product that the organization is introducing and why it is important or valuable to the agricultural industry.

The official product launch will be scheduled as indicated and all key stakeholders will be present. Relevant guides will be provided to all present personnel to provide some basic product insight. Group members will be making presentations to the stakeholders providing them with all the information they need concerning the product.

The end of each presentation will include a question and answer session where group members will provide clarity to the guests. More posters and brochures will be provided to everyone present at the launch. There will be a live system test and users will get to test the system to familiarize themselves with its components and the user interface.

The other relevant marketing techniques will be employed until the product dominates the market.

2.7. Financial Implications

2.7.1. Development costs

Cost Type	**Estimated Amount**
Labor Costs	R12 000.00
Broadband	R5 000.00
Platform (Android or iOS)	R2 000.00
Design (Use Interface)	R2 500.00
Web Development (Front-end and Back-end)	R7 000.00
Testing	R15 000.00
System Changes	R8 000.00

2.7.2. Unit Costs and Investments

The group is willing to put together an investment of R125 000 as the overall project budget. The total invested amount is based on a rough estimate made from studying current IT project cost trends. An estimated 30% will be spent on product marketing as it is important that the product gets to the targeted audience and generates a return.

Cost Per Assets (Unit Cost)	Estimated Amount
Programming Platform	R4 500.00
Software Updates	R1 500.00
Workstation Costs	R22 000.00
Website Hosting Cost	R15 000.00
Storage Drives	R4 000.00
Backup Drives	R5 000.00

2.7.3. Operational Costs

These are the costs related to running the system.

Operational Costs	1. Running Costs	
	• Business cont. testing	R5 000.00
	• Help Desk	R7 000.00
	• Hosting	R15 000.00
	• Software Licenses	R8 000.00
	• Paper	R1 700.00
	• Ink	R2 000.00
	2. User Management	
	• User Provisioning	R6 000.00
	• Password Management	R7 000.00
	• Role Management	R5 000.00

2.7.4. Profit System

The truth of which is most essential, of any project is usually ignored – Why the project is done/conducted? It is done for the value it generates, and that value is from the product or service at the completion of the project.

This implication of omission is very big – if it so happens, projects cost money and use up time, then someone has to do and carry them out. Projects turn into “cost centres”, as everyone knows that organisational costs centres have a far harder time acquiring resources than “profit centres.” As projects are cost centres, the question is, what does the role of project managers take and assume?

The fault is not with the project manager, but in the personnel. The three side of the triple constraint paradigm, is fundamental to every project, and has never been properly integrated. Project Management theory, states that an excellent job has been done, only with the two sides TIME and COST, except the third side. Project SCOPE, which has long been ignored, yet it is most important of the three.

A bad job has been done with that third side, that there is not even unanimity on how it should be labelled. In IT projects, it is most common to see the third side labelled as “QUALITY.” At times, one sees it labelled as “PRODUCT SCOPE.” The latter is at least closer to the mark, even though both are wrong. If it is in the totality of the project, that the third side be labelled as project (“work”) scope, for the simple reason that otherwise something will be left out. Some of the project scope is neither quality nor product scope, e.g. features, but is nevertheless merely work that must be done in order complete a “satisfactory project”, which adds time, money and value to the project.

A time/cost can be built on the basis of either product scope or quality, although it would be smaller, a subset of the total project triangle, and in order to fully get a true Project Integrated Management, the totality of the project must be modelled which leads to Total Project Control (TPC) methodology. Just as the project itself starts with the reason for doing it, our quest for an integrated metric must also start. If we are undertaking the project scope because of the value (contract price, sales revenue, market visibility, productivity improvement, etc.) of the deliverable(s), then surely that is how we should quantify the work scope; by the expected monetary value (EMV) that justifies the spent time and resources.

As we shall see, once a project is being performed, all sorts of decisions will hinge on the answers to these questions. But without doing such analysis, how can we even start? How do we know that this project, and not another, represents the best investment? How do we know how such risk factors as schedule, technical achievability, or resource availability might impact each project’s potential value?

Yet, it is amazing how often this analysis is entirely omitted even for projects requiring multimillion investments.

Exhibit 1. The Three Sides of the Triple Constraint Triangle

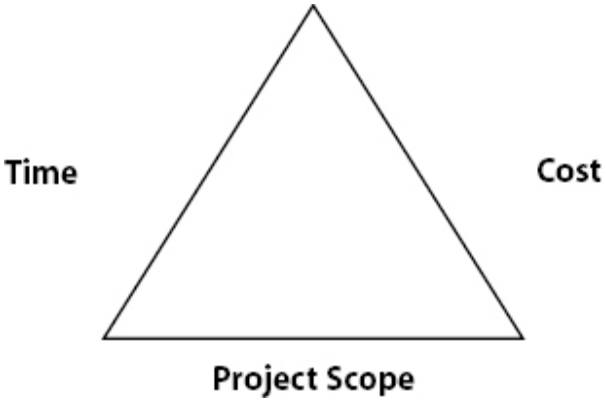
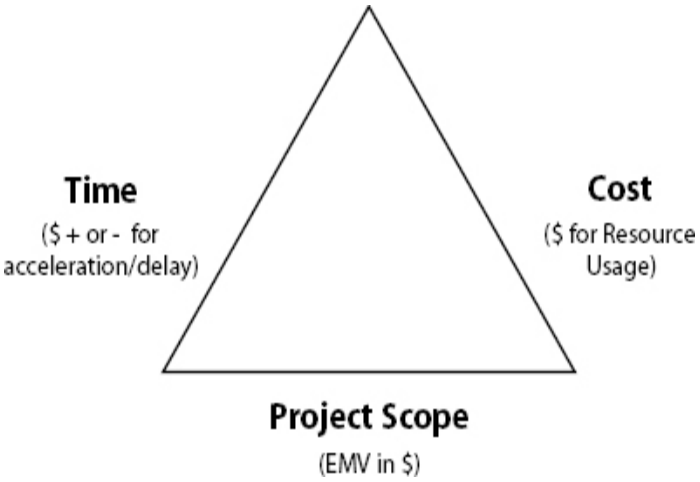


Exhibit 2. Quantifying All Three Sides of the Triple Constraint Triangle



Monetization of the expected value of the project scope, whether performed by the project manager, the CEO, the division vice president, the marketing manager, or the contracted customer, should be one of the first steps in the project management process. All other decisions must then be justified on the basis of this value. Of course, the next step now becomes obvious: the estimated resource use of the project is usually monetized as the COST side of the triangle! And the difference between the monies we expect to generate or save, and the money we estimate having to spend to obtain that value is … the project profit!

Even the individual elements of the project scope, right down to the activity level, can be put to the test: for example, a better package design, but one which adds both time and cost to the project, seem likely to increase the profit. If not, don't do it!

There may be cases where there seems to be no benefit from finishing a project earlier: fixed price contracts with specified delivery and payment dates, and no early delivery incentives. Such situations are distortions caused either:

1. By the contracting process, where the separation between the person receiving the value from the product and the person receiving the value from the contract, are different.

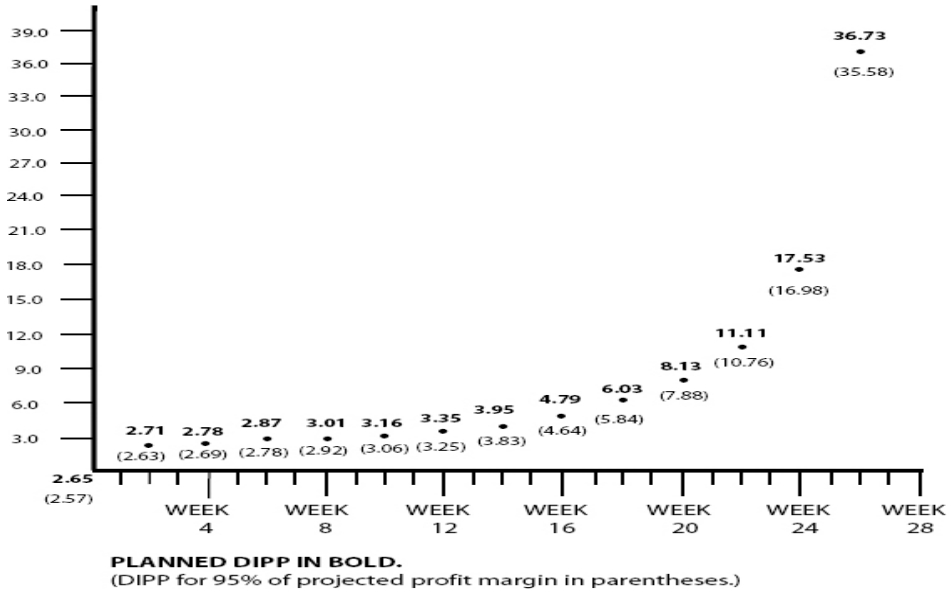
2. By the fact that the full scope of the project has been decomposed into smaller projects, where the projects for the sub-deliverables are not on the critical path of the total project, but actually have float. Their full value is not generated until other parts of the project are completed.

Under the simplest of circumstances, if we recognize that every project is performed for the value generated by its deliverable(s), then, at the very least, finishing the project earlier generates that value earlier, while finishing it later delays receipt of the benefits. Simple net present value principles demonstrate that monetary value received a week later is less than the same value received a week earlier. And so, we have quantified all three sides in the same unit: dollars. PROJECT SCOPE is EMV dollars, COST is resource usage dollars, and TIME is the acceleration premium or delay cost dollars as function on the EMV. Thus, project profit is really:

($EMV + or – $acceleration/delay) – $cost

In addition, and perhaps even more valuable, this allows us to formulate a profitability index. By quantifying the three sides of the Triple Constraint triangle, the DIPP can be used as a barometer to gauge all project decisions:

DIPP = ($EMV + or – $acceleration/delay) divided by Cost ETC



PLANNED DIPP IN BOLD.
(DIPP for 95% of projected profit margin in parentheses.)

At the start of the project, the Cost ETC is the planned budget. As the project proceeds, work is accomplished, resources are used, and costs accrue and migrate from the estimate-to-complete column to the "sunk costs" column. Therefore, the DIPP should curve steadily upward as the denominator declines. If it doesn't, or it does not do so as rapidly as expected, it indicates that either the Cost ETC is declining more slowly than expected, or that the EMV has changed. There are many factors that could cause the EMV to decline. One is a change in market conditions. A second is a pruning of project scope. An even more common explanation, of course, is project delay, which can both reduce the EMV (per TIME delay costs) and prevent the Cost ETC from declining as rapidly as planned.

Whatever the cause, a variance between the planned DIPP curve and the actual one should send a signal that something is wrong. Threshold levels, such as those that are often built in on the earned value indices SPI and CPI, can be built in on the DIPP to allow senior management to oversee the project on an exception basis.

2.7.5. Break-even point

FIXED COSTS	COSTS
Labour Costs	R12 000
Broadband & Platform	R7 000
Repairs & Maintenance (Updates)	R9 500
Testing, Design and Web Dev.	R24 500
Software Licenses	R8 000
Hosting and Help Desk	R22 000
Storage	R9 000
Office Material	R3 700
Work Stations	R22 000
Insurance	R3 500
Taxes (Real Estate, Etc.)	
Interest	
Depreciation	
Other (Specify)	

Miscellaneous Expenses	R5 000
Principal Portion of Debt Payment	
Owner's Draw	R30 000
Total	R156 200
BREAKEVEN SALES LEVEL	R 557 857,14

2.7.6 Advantage for the customer.

The advantage to the customer will be a rental to use subscription, as the system will be maintained and overlooked on our side, they will only pay for a service as well as the features entailed within the packages offered including usage costs. The system will cater to the customer in a manner where, it will provide spot on probability results in accordance to relevant and precise historical data in order to guarantee precise and concise readings and suggestion and future predictions and likelihoods as well as methods to cater for the situation and season

A list of possible benefits can be identified having used and having chosen the aforementioned service model to render as a product:

- Guaranteed continuous service operation
- Low impact costs
- Efficient Processes
- Low Overhead costs
- Redundant and Robust operation
- Integrated services
- Continuous updates and feature integration
- No maintenance costs
- Structured service and feature costs
- Service-On Demand and operation service model (anytime, anyhow and any place)
- Guaranteed QoS
- Affordable and competitive package pricing

- Tiered modelled system to fit type of user

2.8. Stakeholder Concerns

Project managers ought to take the concerns of stakeholder's concerns very seriously, which some do not. Many project managers fail and fall into the thought that a concern is dealing with a problematic stakeholder, when in actual fact that isn't the case.

A project manager is best advised to first understand the issues of concern before coming or arriving at a certain conclusion.
A project manager must:

- Remember that stakeholders probably have vast and extensive experience
- Listen and pay attention to their concerns and
- Understand and fully comprehend the concern and to reassure

If there is an aspect within the project that is of concern, even when the team is not concerned about it, the issue at hand needs to be put dealt with and put into review. A project manager should explain and emphasize why the team wasn't concerned and why they should not be concerned, however, he/she should also realize that the stakeholders may have been in business for an extensive period of time, and might know things of which the project manager doesn't.

As some stakeholders may not understand the project management process of an IT project, they may know little or not at all about IT. As some concerns may be based on that unfamiliarity and ambiguity. Not all concerns can be casted or regarded will be valid, so as to say.
However, the project manager must take the opportune time to educate them and confirm that their concerns are unfounded. One should also take into account that, if someone is a senior business person, he /she understands the environment and production at an intimate and personal level, and wouldn't it be regarded as foolish to disregard and not make use of his/her knowledge…?

It is also important to identify and analyses the stakeholders, for they are the decision makers and the ones impacted by the project. Who are the key subject matter experts? Who will be impacted? Who are the decision makers in that area and who are the subject matter experts? This is a good technique to apply when identifying stakeholders and to ask each one found to nominate others.

The PM should also understand and some time to analyze stakeholders and their potential impact. What are the impacts? When do they occur? How does it affect the stakeholder?
PMs ought to also manage stakeholders' requirements and manage them through the triple constraints (scope, time and cost).

They need to make sure their expectations are appropriately set as well as that the project team does not over promise on the solution. Commitment from key stakeholders and work to sign off on the charter and some other documentation stating agreement and their approach.

On a regular basis, project managers need to revise, and go back and check with existing stakeholders if whether anything has changed or not. Are there new stakeholders? Have impacts changed? Have priorities changed? The more the PMs' frequency in checks, the quicker they will get to pick up and deal with them.

Situations that need to be avoided, that can lead to project sabotage are:

- Buy-in blues
- Short-term profits
- Overachieving
- Lack of Respect

Stakeholders need to be identified and classified in order to manage them and their concerns. One can use different classification models to determine an approach best fitting to manage stakeholders and their relationships.

Stakeholder/ Groups	Role	Internal/ External	Power	Interest	Requirements	Concerns
A.I.M.	Owners	Internal	H	H	To assure source and sustainable use and income To effectively implement platform To have more farmers using system for analysis	To have the same technology/architecture used or repeated by other competitors Idea stolen, redesigned and used for other means or ways than intended Compliance and regulation Migrating previous historical data to servers for analysis (neural ink)

Farmers	Customers/ Managers/ Suppliers	Internal	H	H	To maximize crop yields	Not to have enough or desired water To compete against other stakeholders

					To assure source of income and return on investment To have a reliable water supply in accordance to recommendations To have efficient rotational farming methods To have enough water for growing plants	using system and water efficiency/retention use To lose their income Global warming and erratic weather causing false reading and undesired weather conditions
Employees/ Unions	Employees/ Regulators	Internal	H	H	To have more efficient working processes in training and advancement To continue being the main labor force during system adoption To maintain labor force numbers in regard to system use, thus increase health and safety To increase quality of work and increase in wage due to efficient processes	Retain and maintain employee number Still be a relevant enough workforce Technology advancement takeover by automation Decrease in wages due to cost effective implementations Gender issues
Government	Shareholder/ Regulators	External	H	H	To contribute to the success of the project by supply of all relevant resources	Achieve sustainability goals in a cost-effective manner Achieve effective implementation as stated

					To achieve water quality and levels due to system and cost efficiency To realize governmental support of the project To subsidize some resources and expenses To increase political relevance and support	Have limited financial capacity and budget spending. Push budget over limits
Business Sponsors	Sponsors	External	L	H	To increase investment portfolio To increase return on investment value To be involved in a competitive project	Will yield desired or designated returns as planned Time to realize profits of investment Likelihood of project failure due to economic uncertainty
Environment	Shareholder	Internal	H	L	To provide natural resources and for their use to achieve high quality crops To act as a platform to increase quality of life Regulation and compliance Waste reduction and environmentally friendly practices	Emission and hazardous material compliance realized Eutrophication level decrease realized. Will changes benefit the environment as projected

					To nurture growth in crop production thus increase in exports, GDP, GDP and HDI.	
Community	Society/ Shareholders	External	H	H	To provide occupational chances for members by means of local employment Increase utilization of system Political activity and regulatory compliance To give rise to other grass roots projects to aid in other projects by charitable contributions More access to water with sustainable	Will everyone if not most benefit from project Will project increase local participation first Impact on environment realization Accessibility to water be realized
Institutional Investors	Shareholders/ Creditors	External	L	H	Good corporate governance Good economy rating	Delays due to upcoming fiscal year Losing money invested Not realizing returns in the designated timeframe

Project Management Plan

2.9. Project Overview

The system we are suggesting and proposing incorporates Artificial Intelligence technology to help potential farmers do a careful analysis of the land and environment they wish to farm on, and also track the environmental factors affecting it. Based on the input the user provides the system, it will look at the provided attributes and factors to determine if the land is good enough for farming as well as contrast it with historical data. The application or website will receive user input and do a careful analysis to provide the user with feedback of whether the particular environment is ideal for farming and so on.

2.10 Project Deliverables

- Working application
- Database
- Website
- User and data input

2.11 Purpose of Plan

- Planning provides definition of a project, and also provides direction and consistency towards building the project.

2.12 Project Objectives

- Ensuring that the system is user friendly
- Meeting the project constraints
- Provide quality and high-performance system
- Meeting project goals in time
- Provide system with accurate analysis

2.13 Project Scope

- The project will provide an application and a website which are going to be used by clients via smartphones, PC's in acquiring information required about a certain land
- Unregistered users will have to sign up in order to access the system.

- Registered users will have to login to the system and input results gathered about a certain land and the system will automatically analyse information and output results

2.14 Major Milestones

The following represent key project milestones, with estimated completion dates:

MILESTONE	ESTIMATED COMPLETION DATE
Phase 1: Scope Completion	21/02/2020
Phase 2: Analysis completion	20/03/2020
Phase 3: Design Completion	15/03/2020
Phase 4: Development Completion	20/11/2020
Phase 5: Testing	18/11/2020
Phase 6: Documents Completion	22/11/2020

2.15 Required Resources

- Computer
- Data collected by the user on a specific

2.16 Systems Terms

TERMS	DEFINITION
• User	• A person who interacts with the system
• Administrator	• A person who has authority to manage and control the system

2.17 Project Assumptions

- Everyone has a mobile device
- Most people have apple device
- Everyone can visit the world-wide web
- Everyone knows how to use these devices
- Commercial farmers will allow us to work with them
- Users will fully adopt the benefits of the application for Consulting
- The Project Plan may change as new information and issues are revealed

2.18 Project Constraint

- Time
- Cost (to travel to client)
- Student strikes
- Not meeting deadline
- Application not working successfully
- Application not accepted by the audience

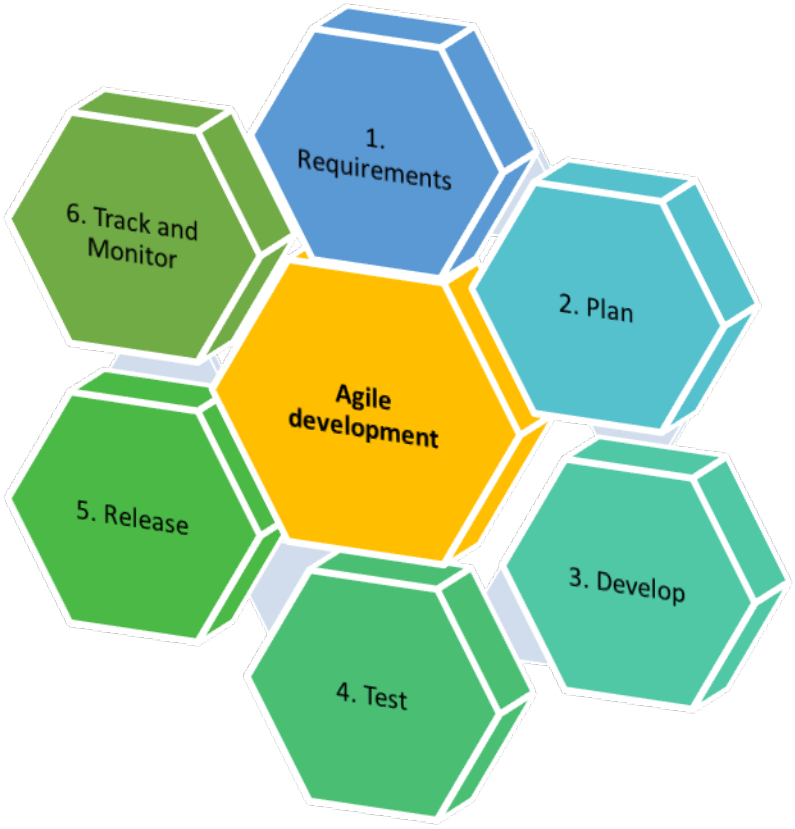
2.19 Project Organization

The name of our project is Harvest Ideas Mechanics. It will be authorized, integrated and executed by us as students. Our project is about the development of a software architecture that will assist potential farm owners discover new arable plots of farm land. The application we developing will receive user input and perform a careful analysis to provide the user with feedback on whether the particular environment is ideal for farming.

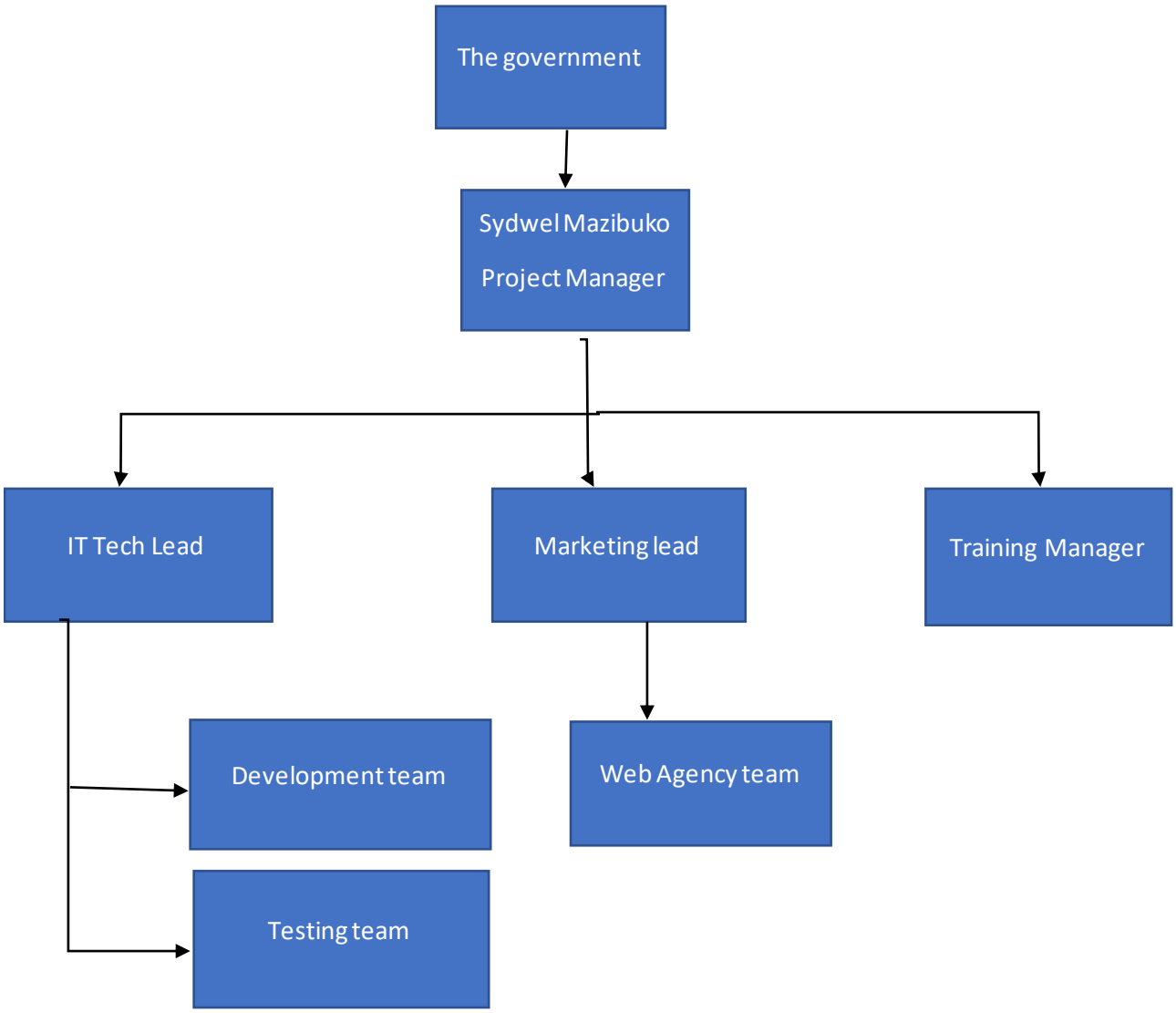
2.20 The Process Model

Agile Development Model

We have chosen to use the Agile Development method because it allows many scopes for amendments all through the complete life cycle of the application development. Agile method helps in offering frequent updates with implementation or fixing bugs to give a user unmatched experience.



2.22 Organizational Structure



2.23 Project Responsibilities

ROLE	DESCRIPTION	NAME
PROJECT MANAGER	LEADS AND MANAGES PROJECT TEAM	SINAZO MATYILA
PROJECT SPONSOR	PROVIDES FINANCIAL RESOURCES FOR THE SOFTWARE PROJECT	THE GOVERNEMENT
TECHNICAL LEAD	TANSLATES BUSINESS REQUIREMENTS INTO A TECHNICAL SOLUTION	ALI MOOSA
SOFTWARE DEVELOPERS	RESPONSIBLE FOR THE DEVELOPMENT OF THE APP AND THE WEBSITE	SAMKELO SIFUNDA
SOFTWARE TESTER	ENSURES SOFTWARE SOLUTION MEETS THE BUSINESS REQUIREMENTS, AND THAT IT IS FREE OF BUGS AMD ERRORS	TEBOHO MASHIGO
BUSINESS ANALYST	DOCUMENT TECHNICAL AND BUSINESS REQUIREMENTS	NANCY MBUYANE

2.24 Managerial Process

The philosophy behind the crop monitoring system is to bring to farmers and stakeholders real time vegetation monitoring. Monitoring crops during the growth and harvesting, minimizing any potential risks of loses.

The aim of precision, or site-specific, farming is to identify differences in soil characteristics and yield potential between areas within a field and to respond by modifying crop management practices accordingly. The precision farming starts by identifying variables.

2.25 Properties for managing the project

- Shared vision – Project manager can articulate the vision to the team very well. A visionary person can lead their team to the right direction.
- Technical expertise – A team must have sound technical knowledge to understand the issues that are related to technical aspects.

- Strong leadership skills – Having a project manager that has strong leadership qualities, such as being able to motivate the team and drive them to maximum performance.
- Effective communication – One of the qualities of an effective team is that they can connect with each other at all levels. The project manager must clearly explain the goal to the team as well as each member's tasks, responsibilities, expectations and feedback.
- Team building skills – it is necessary that a team works in unison otherwise the project will undergo various relationship challenges that might hinder the success.
- Competence – The team must be able to push themselves over the limit and challenge themselves to become the best in the field.
- Emphatic – Understanding and caring for people as well as being grateful for their help are a few of the things that an emphatic leader shows to his members. It includes understanding the needs of the project and its stakeholders.

Project Dimension	Fixed	Constraints	Flexible
Cost			x
Schedule	x		
Scope (Functionality)		x	

2.26 Risk Management

2.27 Process to Identifying risks

- Interviews – Selecting key stakeholders. Planning the interviews. Define the specific questions and documents the results of the interview.
- Checklists
- Assumptions analysis – Assumptions are sources of risks. The project manager should ask the team what assumptions they might have on the project. Furthermore, they should be documented.
- Cause and effect diagrams.
- Affinity diagrams.

2.28 Process to analyse risks.

- Identifying global risks to the whole project.
- Analyse risks to determine which ones are the most important.
- Elaborate strategies to handle the most important risks effectively.
- Estimating costs and benefits of the strategies to determine if they are viable.

2.29 Process to manage risk factors.

- Creating a risk register including date of the risk being logged, risk description, likelihood, impact, risk response and action.
- Identifying opportunities. When you identify risks, also factor in the positive risks and opportunities.
- Once determined what you will do to address each risk, estimate how much it will cost you to do so.
- Assigning an owner to each risk. The owner should be the person most suited to deal with the risk.
- Setting aside time to review risks and identify new risks if they are available.
- Report on all the risks.

2.30 Staff Approach

- Skills required for the project

  - Project manager – Responsible for coordinating the various team members and the resources for completing the project on time.
  - System analyst – A professional with the expertise to analyse and design business system.
  - Programmers – A technical specialist responsible for developing specific computer programs that meet the user specification.
  - Test Engineer – Responsible for identifying and subsequently defining the required tests, monitoring the test coverage and evaluating the overall quality when testing.
  - Database administrator – A specialist that models, designs and creates the database tables used in software solution.

2.31 Team recruitment

The project manager will be responsible for the recruiting of all the team members.

- Letting candidates come to us.

  - Advertise
  - Review the applicant
  - Shortlist the candidate
  - Interview
  - Make an offer

- Seeking out suitable candidates

  - Approach their manager
  - Interview
  - Make an offer

There would not be any training required for these team members since all of them are professional and they have the required experience for the project at hand.

2.32 Technical Process

2.33 Methods, Tools and Techniques

The type of computer device that the team will use to code and run the system will have an i5 processor and 8 gigabytes of RAM as minimum requirements. This type of device will ensure that the system runs smoothly without any technical errors. The group will use the agile development method to develop the system as it is more user engaging than the linear System Development Lifecycle.

The system should perform well and provide accurate output that conforms to the standards of the agricultural field of study. The team is made up of 5 members that equally divide the work load when documenting the system. The aim is to have an efficient and effective system that produces the most accurate results. The system must not cause harm or produce results that are bias.

The web interface side of the system will be coded using HTML, PHP for connecting to the database, CSS for styling, JavaScript and there will be some SQL queries to access and manipulate the data in the database. The android mobile application side of the system will be coded using android studio version 3.6.0 with Kotlin. The purpose of the mobile application is to cater for small time farm owners or home owners with gardens.

The system will be tested in multiple android devices and workstations for compatibility as it should support more devices. User testing will be performed every now and again to check if the system is meeting the user requirements. As discussed above the team will use the agile method for the system's development. The system's project idea will be the initial document the group will compile followed by the project management plan and the system's requirement document. The most important requirement is that the system should be able to predict if an area is good for farming.

2.34 Software Documentation

The final product for this project will be a web-based system for commercial farm owners or potential farm owners. The system will allow input from the user which it will use to perform calculations or do a land survey. The android mobile application will be for small time farm owners or home garden owners. The mobile application will do the same work as the web-based service.

2.35 Software Requirements Specification

The Harvest system's basic functionality is to help farmers or potential farm owners to do a survey to check if land is good for farming. The system will register user details and help them create an account in which they can log into the system with and make use of the system's features.

The system will prompt the user for input which will act as variables it will need in order for it to perform the prediction. The system will have a welcome screen where users will fill in a form to register and log in. The other screens will be forms accepting user input. Basic input will be the soil type if it is sandy or clay soil, how close to the road the area is, the soil is acidic level, if the area is a slope, is the area rocky, when last did the area experience rainfall, the current weather etc.

2.36 Software Design Description.

The software interface will include a very attractive opening screen with the Harvest logo in front. The user will be directed to register if he or she is a first-time user. There will also be an option to login after registration or for already registered users.

The other screens will include a form that will accept various user input regarding the designated area. The fields will accept the user input in which the form will use as variables that will be used to make the predictions. Some measurements the user will have to make themselves and record on the system.

The system's database will keep records of all user input. The first input it will store will be the user's personal information and will be the user credentials the system will use to verify the user. The other input the system will store will be all the data the user inputs about the designated area as mention above.

2.37 User Documentation

The project documentation will be the initial task for the project. The project will be documented before any practical work or coding can be done. The project has to be carefully planned to avoid any schedule, technical and financial irregularities.

The project or topic description will be the initial document that will be compiled and submitted. The documentation will outline what the project is and what does it do. The second document will be the project plan which will outline how the team will go about developing the system, the system requirements, the system's description etc.

2.38 Project Support Functions

The project or system will not require any installation on a computer device since it will be a web-based system. A user will only be required to download and install the mobile application from google play store. The team will continuously work on the project or system upgrades and provide users with system updates.

User testing will help familiarize users with system and its functions. The team will take users through the system and tutor them on how they register, login and how they can use the system. A quotation of pricing will be done with of pricing will be done with computer hardware and software supplies to acquire product and pricing information for computers, applications and peripheral equipment.

2.39 Project Requirements

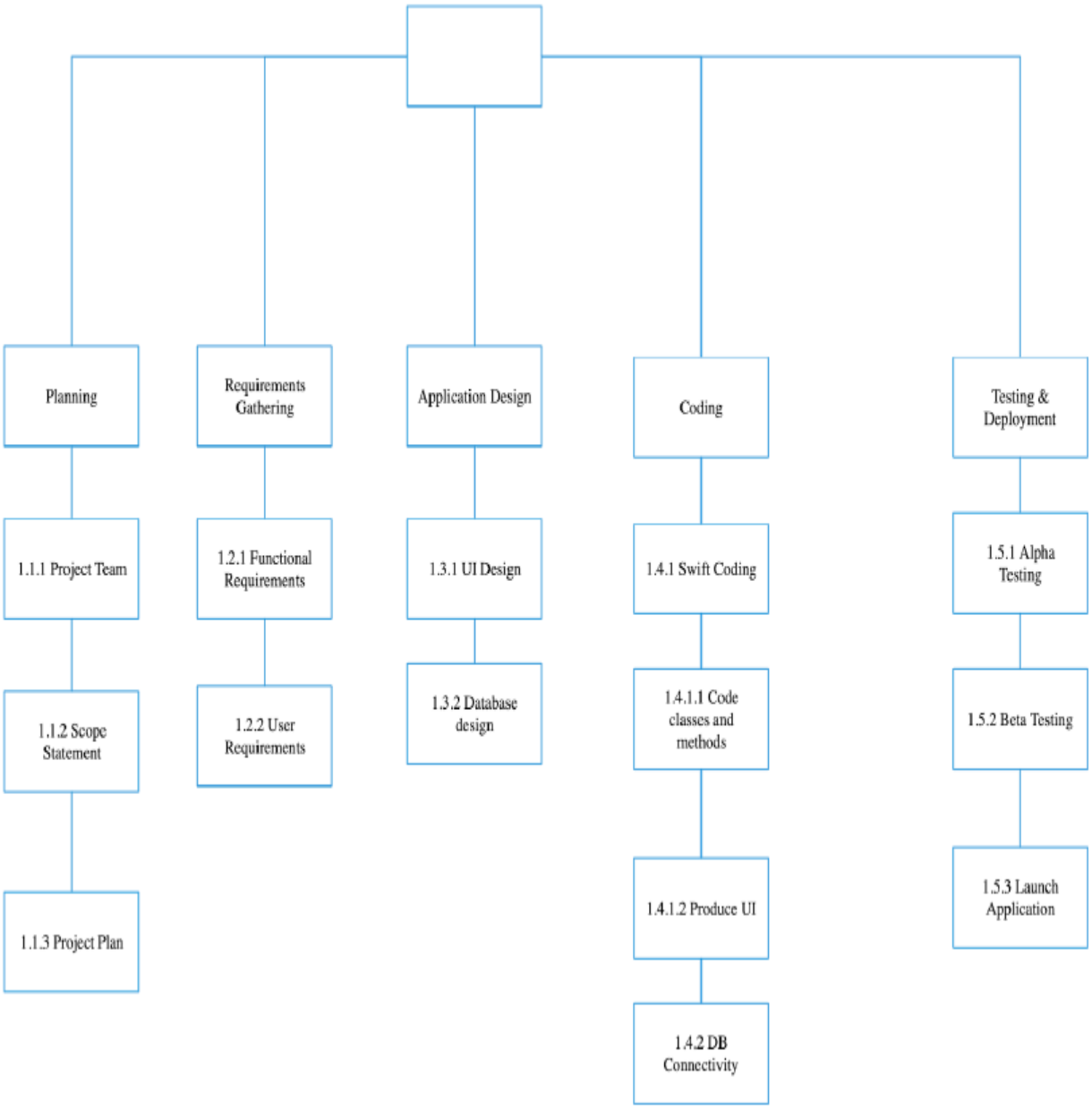
2.40 Functional requirements

- Login and Sign up
- Create user account
- Collect field data input by user
- Perform an analysis of field data
- Provide results of field data

2.41 Non-functional requirements

- Security
- Response time for the application
- CPU & Memory
- Network Conditions
- Security
- Response time for user registration

2.42 The Work Breakdown Structure



2.45 Harvest System: Work Break Down Structure

1.1 Planning
- 1.1.1 Project Team
- 1.1.2 Scope Statement
- 1.1.3 Project Plan

1.2 Requirement Gathering
- 1.2.1 Functional Requirements
- 1.2.2 User Requirements

1.3 Application Design
- 1.3.1 UI Design
- 1.3.2 Database

1.4 Coding
- 1.4.1 Android Kotlin Coding
- 1.4.1.1 Code and classes and methods
- 1.4.1.2 Produce UI I

1.4.2 DB Connectivity

1.5 Testing and Deployment

- 1.5.1 Alpha Testing

1.5.2 Beta Testing

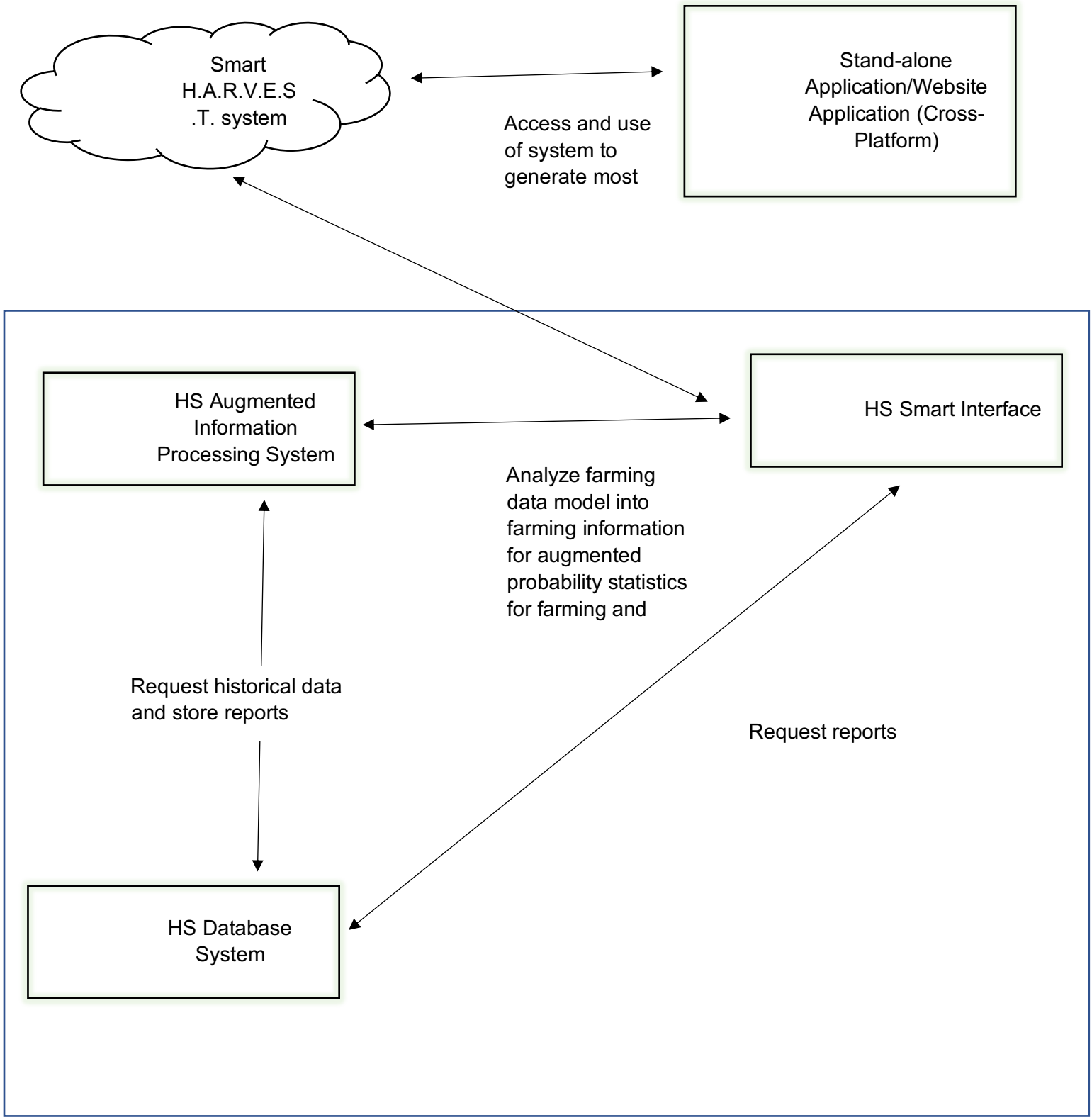
1.5.3 Launch Application

CHAPTER 3

3.1 Architectural Vision

The system designed in this project consists of the following built-in sub-systems, a subset of these sub-systems are shown in the table below and the communication between different HS systems.

HS-CAS	Client Application System	On the customer's end devices, the application will be installed as a stand-alone app or either used as a website application. The website application will be quite similar to a browser-plugin but built into the website's engine. The client application will run on all of these devices in a cross-platform fashion and architecture. It will display all the critical and necessary information to allow the user to interact with this generated information, as well use it to deduce farming conditions of an area. This will be based on all considered environmental factors and conditions. It will also allow the user to sign up or login to a pre-existing account into the system.
HS-DSS	Data Storage System	The data storage system is a built-in subsystem, where all the information generated will be/is stored in data storage devices, for access and after post-processing as reports, e.g. server, where the user's devices will be/are connected to. This boundary of the system will maintain the storage of the generated data in the form of reports as well as historical data in an organised format.
HS-AIPS	Augmented Information Processing System	The AIPS system is a sub system where all the historically fed data will be analysed, processed as well as modelled in relation to the data of the user through an algorithm by machine learning methods, operating in and through the devices they use to connect to the system, as well as to also contrast and give recommendations for farming and environmental conditions. For e.g. Data modelling system, Simulated probability system, Climate control system (weather and temperature regulation), Soil pH-level monitoring system, and Soil-nutrient monitoring system.


Smart
H.A.R.V.E.S
.T. system
Stand-alone
Application/Website
Application (Cross-
Platform)
Access and use
of system to
generate most
HS Augmented
Information
Processing System
HS Smart Interface
Analyze farming
data model into
farming information
for augmented
probability statistics
for farming and
Request historical data
and store reports
Request reports
HS Database
System

Stakeholders	Concerns
Farmers (Customers)	Who will own and use the Harvest system: • **Affordability**: It should be easy for farmers to acquire the system. • **Maintainability**: It should be easy handle software version updates. • **System use**: It should be easy for farmers to make effective use of the system. • **Extensibility**: It should be possible to extend the functionality of the Harvest system easily. (E.g. can support addition of a camera for monitoring plant development). • **Data and Connectivity**: Farmers will not struggle with internet connection and data affordability.
Project manager	• **Project cost**: Will developing the system be affordable or expensive. • **Lack of stakeholder engagement -** this can be a disinterested team member or a client. The project manager must communicate openly and encourage feedback at every step to create greater engagement among participants. • **Team management** – will the project team work well together and with the project manager?
The project sponsor (government)	• **Regulations** – will the system adhere to government regulations? • **Privacy** – will the system protect user data from external parties or hackers? • **System effectiveness** – will the system meet its requirements and perform as intended?
The business analyst	Might face difficulty in getting clear and detailed requirements from stakeholders for the project. Poor communication between the project team and the farmers.

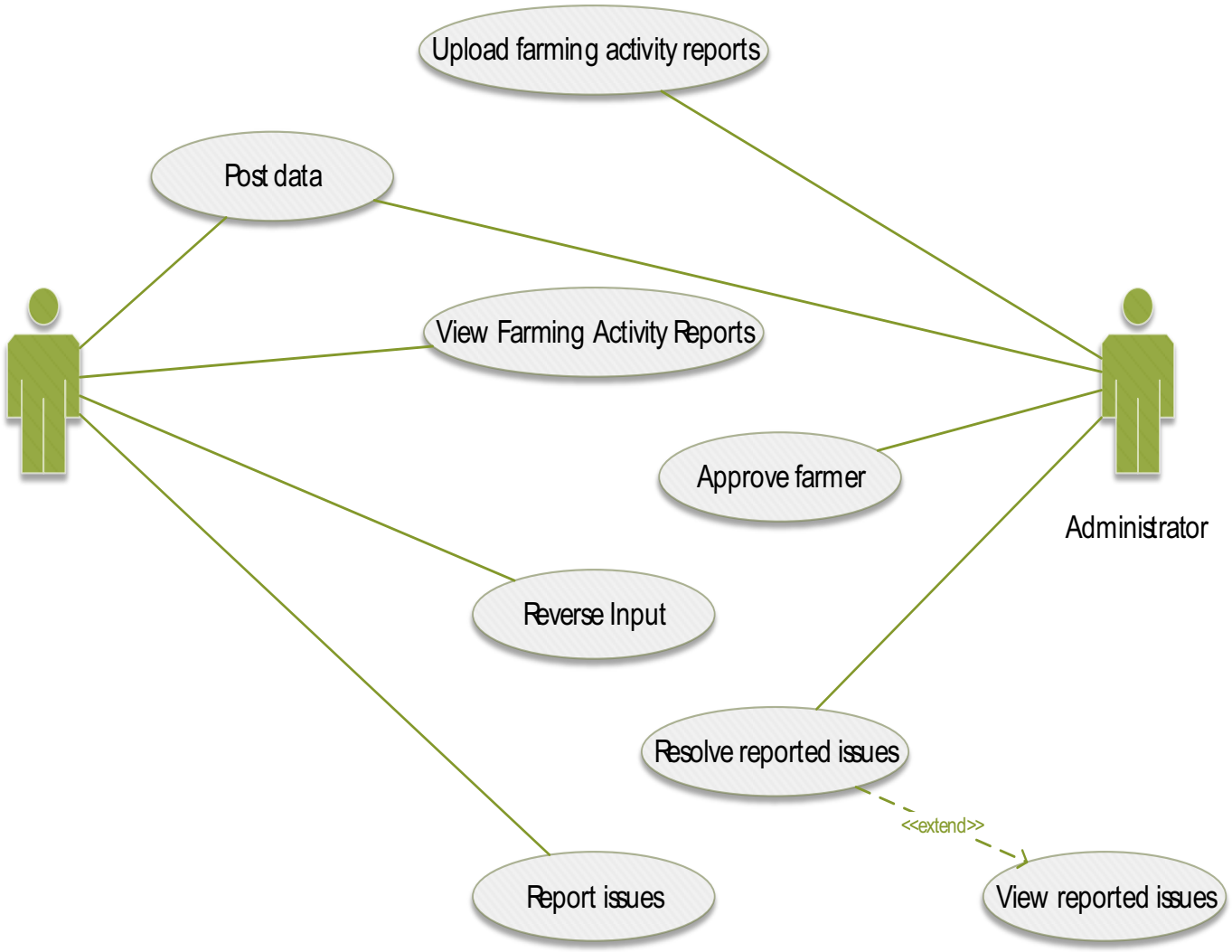
System tester	Traceability to software artifacts (the numbers of requirements that have been validated by a test case).
The development team	They are concerned with whether users will fully adopt to the application being developed for them. Building a continuous evolving system or application.

3.3 Key drivers

- **USABILITY**: the system will be used by potential farmers and companies; access of the system will be via website and a mobile application installed on mobile cell phones.
- **MAINTAINABILITY:** only developers will be able to keep maintenance of the system because they are the only ones to access the code.
- **AVAILABILITY**: end users will be able to use the system even when connected to the internet via the installed mobile application.
- **QUALITY:** it will be more efficient to users and highly advanced features available.
- **INTEROPERABILITY**: system is related anyone interested in farming as long as they have certain data about a certain land, they can access it.

3.4 Stories and use cases

- Overall system use case.



3.5 Functional requirements

ID	Requirements	Priority
Login and Sign Up		
001	The Harvest system should allow the user to input his/her personal information and sign up.	Must
002	The Harvest system must enable users to log in to their accounts using their username and password.	Must
Create a user account		
003	The Harvest system must allow a user to fill in their personal information and create a user account.	Must
004	The Harvest system must create a user account that is unique for every user.	Must
Collect field data		
005	The Harvest system must have a form to collect all the field data.	Must
006	The Harvest system must allow the user the user to input data collected the user collected manually.	Must
Store field data		
007	The Harvest system must have a database that will store all the data the user inputs for processing.	Must
Process field data		
008	The Harvest system must use an AI algorithm to process and analyse the field data the user to produce results.	Must
Graphical user interface		

009	The Harvest system must have a form to register a user.	Must
010	The Harvest system must have two fields for a username and password to allow a user to login.	Must
011	The Harvest system can have an attractive logo on the welcome screen	Optional
012	The Harvest system must have a form where the user will input all the data collected from the field.	Must
013	The Harvest system must have a screen to display all the results after processing.	Must

3.5.1 Commercial non-functional requirements

ID	Requirements	Priority
014	The system must reduce the overall amount of time it takes to survey and analyse land for farming.	Must
015	The system generate revenue after 6 months of official launch.	Must
016	The system should have proper manuals for installation and configuration.	Optional

3.5.2 Technical non-functional requirements

ID	Requirements	Priority
017	The Harvest system should be able to process the results within 5 seconds.	Must
018	The Harvest system must be secure, a user must be able to gain access to their accounts and not on other accounts.	Must
019	The Harvest system should be able to register user details on the database within 3 seconds.	Must
020	The Harvest system should work properly on any web browser.	Must
021	The Harvest system should work well on all android devices, current and old.	Must
022	The Harvest system should be easy to use for commercial and domestic purposes.	Must
023	The mobile part of the Harvest system must be accompanied by easy installation instructions and be easy to install.	Must
024	The user interface must be appealing to the user.	Optional

3.5.3 Evolution requirements

ID	Requirements	Priority
025	It should be able to monitor plant growth and provide user with live feed of plant's wellbeing.	Future
026	Provide user with real time weather updates.	Future

3.5.4 Risk Assessment

Risk	Probability	Severity	Weight	Responsibility	Threshold	Prevention	Reaction
Business							
Product over budget	2	2	4	System architect	Costs of the development of the system is more than estimated	Doing better research	• Find more investors • Find new business partners • reduce requirements
Deadline not feasible	2	2	4	System architect Project manager	The date of the launch is beyond the planned date	Doing better planning	• Reduce requirements • more reasonable deadline • use more manpower
Competition launches same product	1	3	3	Management	The competition launches an identical product earlier than you	Launch your product earlier and make it better.	• Improve product to gain competitive advantages • improve manpower
Product too	1	2	2	Management	The product is too expensive,	Cut requirement	• Cut requirements

expensive					so customers don't buy it	s, decrease service	• Make product more simple
Technological							
Security fails	1	3	3	Designer	Other people can access data	Improve security	• Block external access • Higher security level
Slow response time	1	1	1	Systems engineer	System responses too late	Use better hardware, improve software	• Replace hardware • software update
Implementation							
Bugs during implementation	3	1	3	Designer	During implementation at home system doesn't work	Making installing easier, Include bug finder/testers	• Test • Find bugs • Replace components
Operation							
Hardware crashes	2	3	3	System architect	During the operation the hardware crashes	Improve hardware, use hardware with higher capacity	• replace hardware • fix hardware
Software crashes	1	3	3	System architect	During the operation the software crashes	Improve bug handling	• Reset system • Maintenance by operator
Process							
Doesn't realize cost savings	1	3	3	System architect	After implementation of system, the energy costs don't decrease	Improve decision methods	• Software update

Others							
Significant Risks haven't been identified	1	3	3	System architect	Unexpected risk occurs	Consult third party More brainstorming	• Workaround • fix/update

CHAPTER 4

System Design Document

Document Overview

The Software Design Document is a document to provide documentation which will be used to aid in software development by providing the details for how the software should be built. Within the Software Design Document are narrative and graphical documentation of the software design for the project including use case models, entity relation diagrams, data flow diagrams, and other supporting requirement information.

4.2 Scope

The SDD documents and tracks the necessary information required to effectively define architecture and system design in order to give the development team guidance on the architecture of the system to be developed. Design documents are incrementally and iteratively produced during the system development life cycle, based on the particular circumstances of the information technology project and the system development methodology used for developing the system.

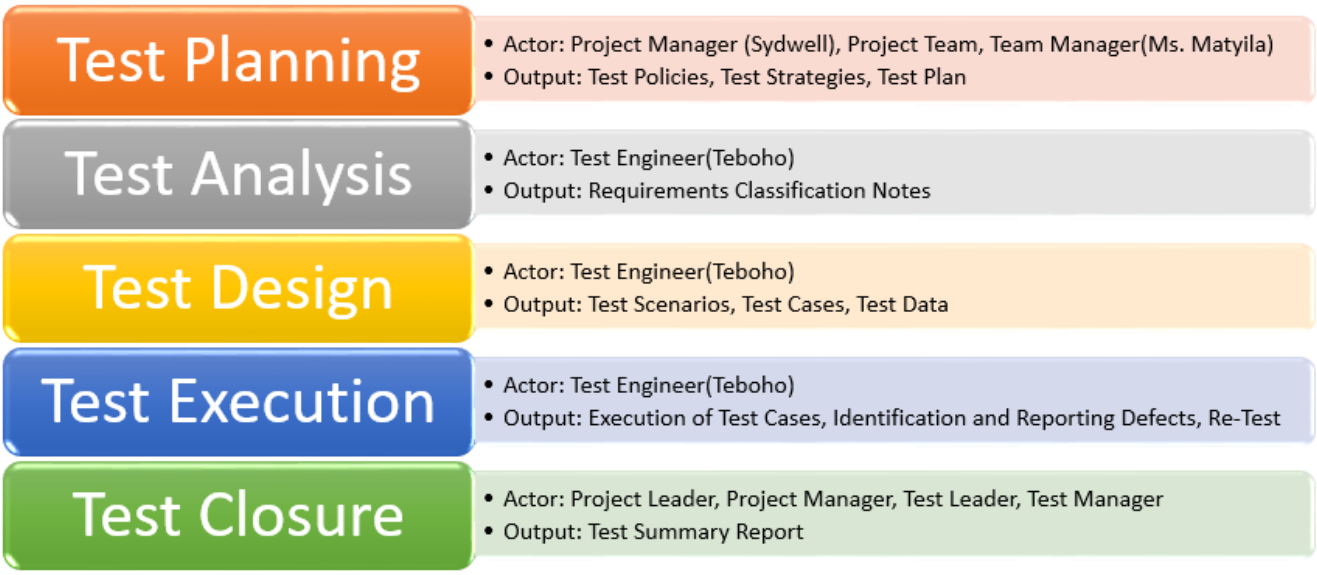
4.3 Audience

The intended audience for the SDD is the project manager, project team, and the future development team. The audience or users for this system design document include the following:

- AIM Project Management Team
- AIM Information Technology Team
- Future Application Development Team
- AIM Project Managers and Oversight Team
- Internal Consulting Team

4.4 Related Documentation

1. **Test plans**



2. The project team creates and manages a significant number of project deliverables to maintain adequate control of the project. For these projects, the project manager should consider establishing a project repository that is aligned with the methodologies and required deliverables.

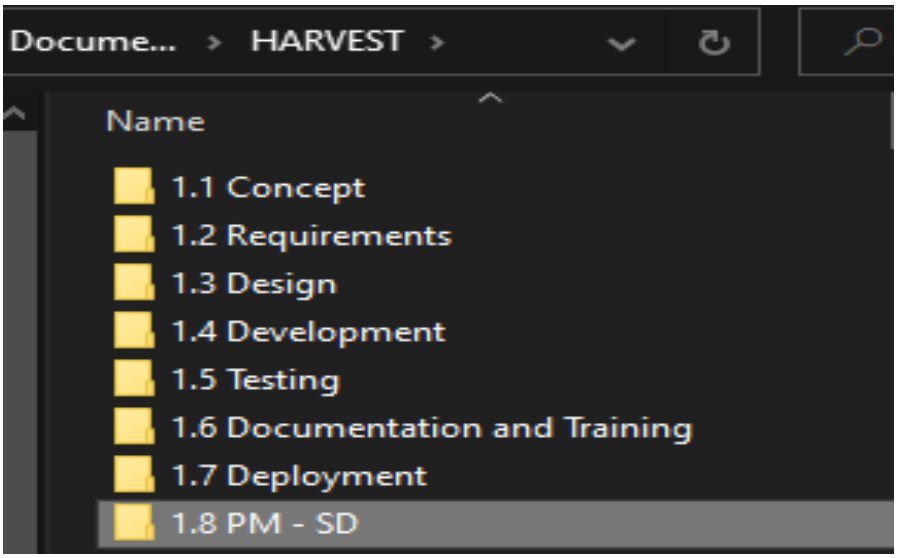
Project Repository Structure

WBS ID	Folder and subfolder name	Documents
1	Harvest	• Project Name
1.1	Concept	• Project Initiation Document (PID) • Concept Analysis Document (CAD)
1.2	Requirements	• Software Requirements Specification (SRS) • Requirements Traceability Matrix (RTM) • Use case • Support Expectation • Technical Evaluation • Requirements walkthrough • System Diagram

1.3	Design	• High Level Design Document • Detailed Design Document • Design Walkthrough
1.4	Development	• Code Walkthrough
1.5	Testing	• Test Plan • Defects Tracking Log • Acceptance Test • Final Test Report
1.6	Documentation and Training	• Training Plan • Documentation Plan • Standard Documentation Evaluation Form
1.7	Deployment	• System/Application Support • Deployment Strategy and Plan • Release Readiness Review • Installation Test • Initial Release Final Report • Deliverables Acceptance Form • Support Interaction Final Report
1.8	Project Management	• Project Initiation Document • Management Approaches • Communication Matrix • Project Closeout Report • Client Satisfaction Survey
1.81	Change Control	• Request for Change • Change Log
1.82	Contracts	• Contractual Agreements • Legal Documents
1.83	Costs and Justification	• Business Case • Project Funding Form • Project Budget • Project Budget Report
1.84	Meetings & Memos (client, team, steering committee, etc.)	• Agenda and Notes

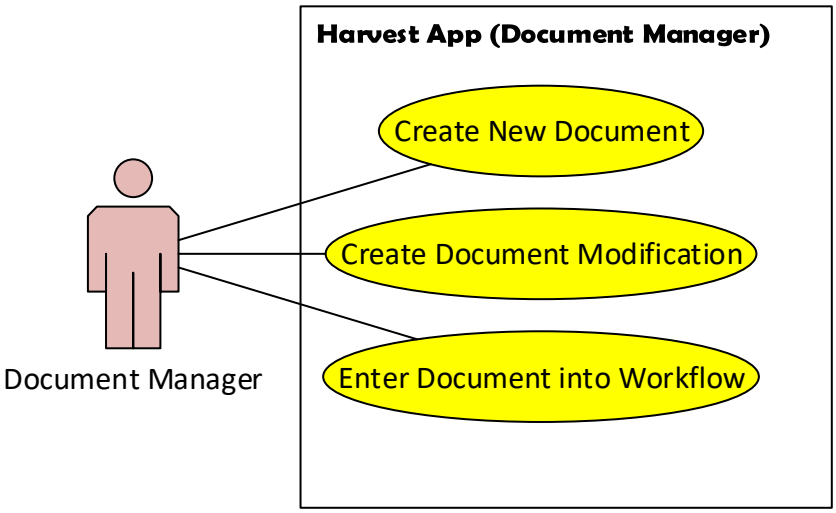
1.85	Project Logs	• Risk and Response Log • Lesson Learned • Issues Log
1.86	Project Team	• Team Member Evaluation • Project Organisation Chart • Project Survey
1.87	Schedule	• Project Schedule • WBS • Project Timeline
1.88	SCM (Software Configuration Management)	• SCM Plan
1.89	Status Report	• Project Report • Team Member Status Report • Executive Status Report • Quarterly Operations Review

3. The following is a picture of a shared folder that was created for the project. This was done so that the project could be managed easily by the project team and keep track of the deliverables.

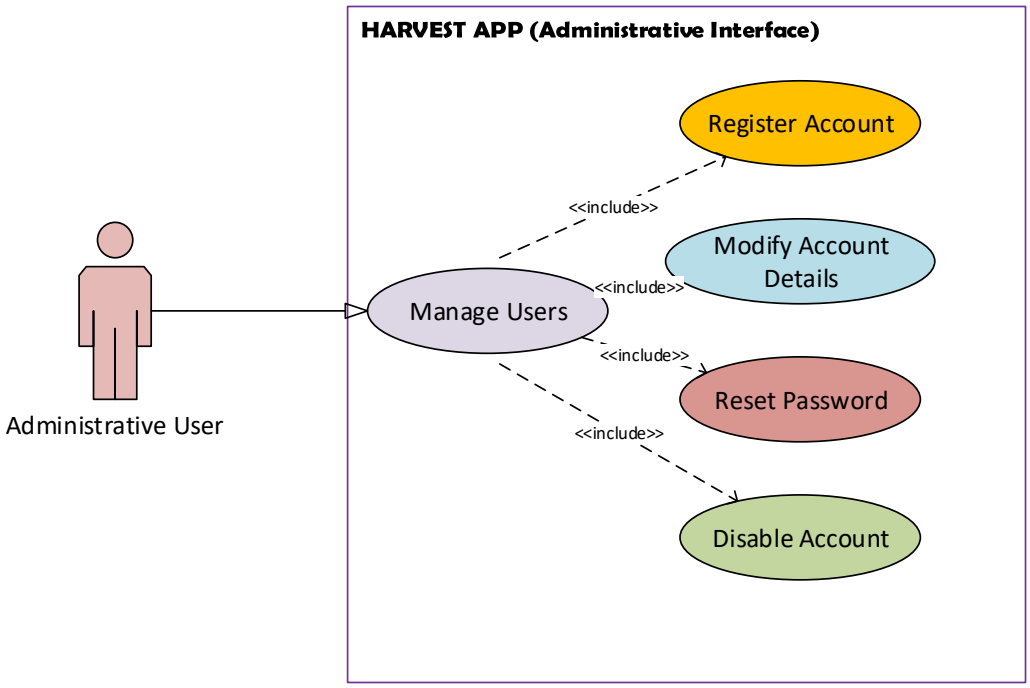


4.5 Document Convention

The following illustrations indicates how document managers play a role in the design of the project.



The administrator of the Harvest App has certain privileges in the design of the project, some of those include managing users, modifying account details, registering accounts and resetting passwords.



4.5. SYSTEM OVERVIEW

The one of the bestselling points of the Harvest App will be its interface design. It is built in a sophisticated manner not like any other app. Key software features will include a knowledge centre, help desk, reports, manage account, crop view, it will also have security features that is second to none.

4.6 Description

KEY SOTWARE FEATURES
DASHBOARD
Manage Account
• History • Issues • New updates • Share Price
Reports
• Weekly crop report • Weather Updates • Soil Management Reports
Knowledge Centre
• Payments • Invoices
Help Desk
KEY SECURITY FEATURES
SOFTWARE SECURITY
• Software is build using the Security Development Lifecycle • Datacentres managed and monitored 24/7, 365 days a year • Security using centralised monitoring, providing timely alert • Security engineers using the latest techniques to eliminate threats before they become a risk

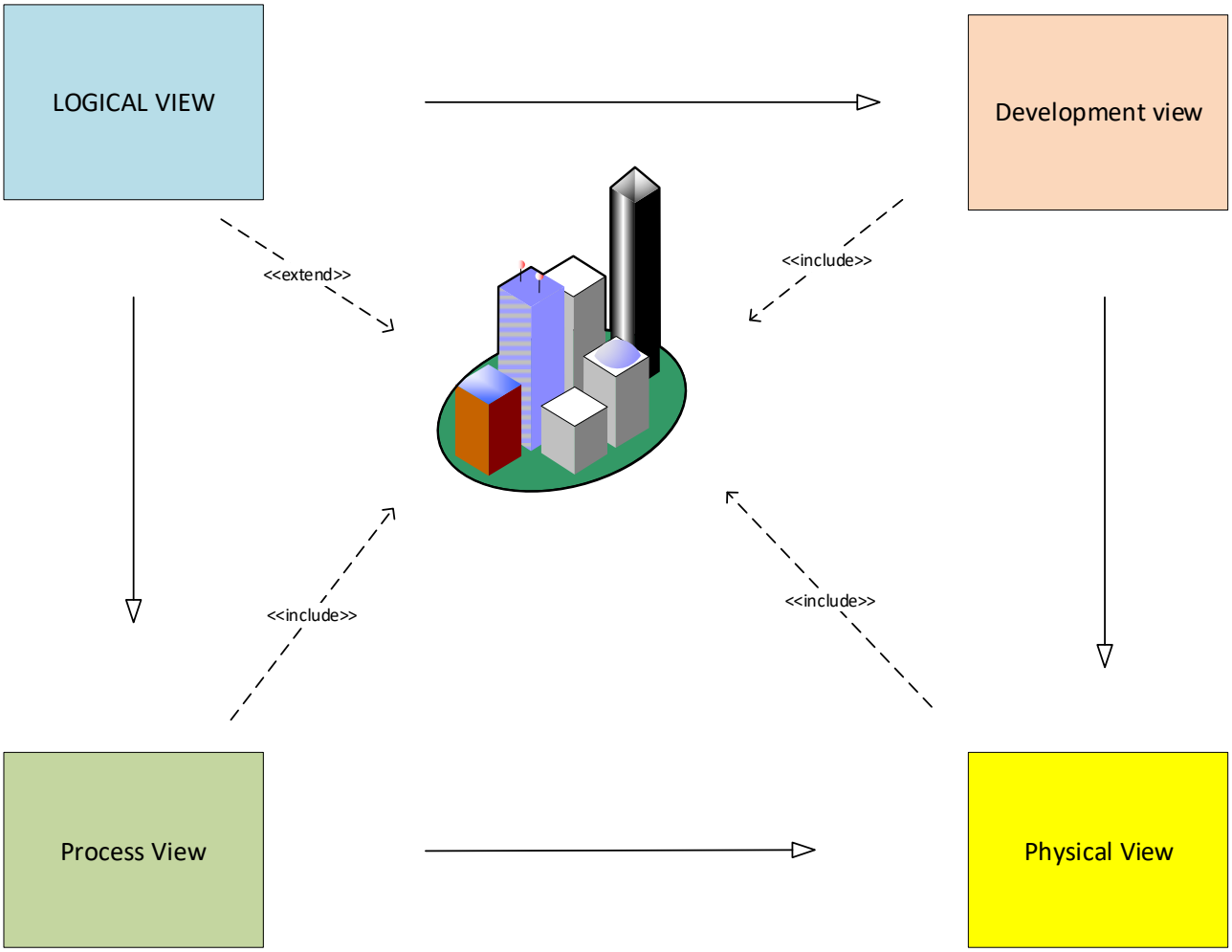
4.7 System architecture

Software architecture

Software architecture description involves the principles and practices of modelling and representing architectures, using mechanisms such as architecture description languages, architecture viewpoints, and architecture frameworks.

- **Architecture Description Languages (ISO/IEC/IEEE)**
- **Architecture viewpoint**

Architectural view model



Architecture Activities

There are many activities that a software architect performs. The project manager works with the software architect to discuss the requirements with stakeholders, design the software architecture, evaluate a design, communicate with designers and stakeholders and documents the architectural design. The following are the four core architectural activities performed at the different stage of the software development life-cycle.

- Architectural analysis
- Architectural evaluation
- Architectural evolution
- Architectural support activities

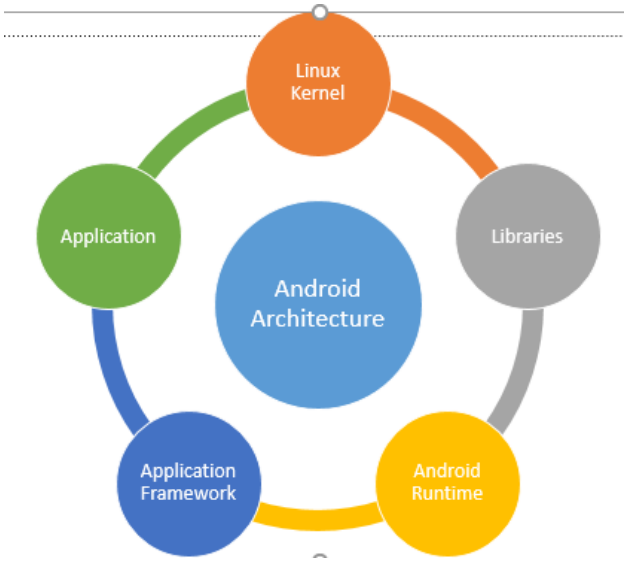
Android Tools

- Latest version of JDK
- Android SDK
- Apache Ant(Another Neat Toll) – an open source tool that automates aspects of the Android build process
- Gradle – An advanced build toolkit that manages dependencies and allows you to define custom build logic

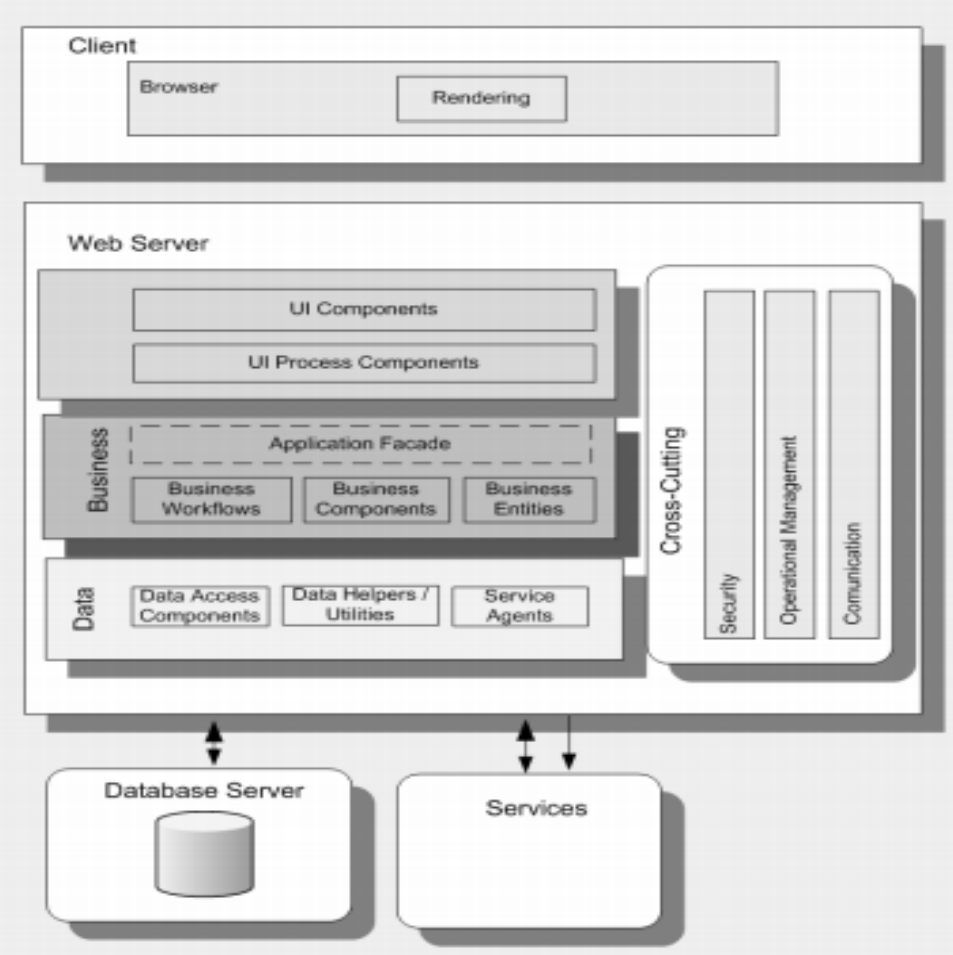
Windows Desktop tools

- Net framework 2.0 & 3.5 – for the Build Release mode
- Net framework 2.0 & 3.5 4.6.1 – Required if you are using Offline Objects feature for both Debug and Release modes

For the android based app the architecture will be as the picture.



Web Application Architecture



Hardware Architecture

The hardware architecture is a view of the physical architecture, which represents the hardware components and their interrelationships.

The table below lists the hardware requirements for the Harvest project.

CPU	Pentium 4 2GHz or more (Multi-core processor recommended)
Memory	1GB and over (2GB or more recommended)
Storage	3GB and over,
OS	Microsoft Windows XP/ Windows Vista/ Windows 7/8/8.1/10 (32bit/64bit)
Display	1024*768 pixels and over (1440*900 or more recommended)

4.8 Hardware Design

Computer Systems

The Harvest App will be run on Android and the Web.

Hardware Components Peripherals

Output	• Printer • Projector • Computer display
Input	• Keyboard • Computer mouse • Image scanner • Webcam
Storage device	• Disk drive • Smartphone storage interface • Flash drive
Input/output	• Network Interface Controller

Networks

Routers	• These devices help transmit packets to their destinations by charting a path through a sea of interconnected networking devices using different networking topologies. • They store information about the networks they are connected to.
Switch	• This is an intelligent multiport device that improves network efficiency. • It allows connections to systems like hubs and routers.
Hub	• This device connects multiple computer networking devises together, and also acts as a repeater. • It can be used for both digital and analogue data.
Gateway	• Gateway provides translation between networking technologies such as OSI and TCP/IP. • They connect two or more autonomous networks.
Bridge	• This device is used to connect two or more hosts or network segments together. • They store and forward frames between different segments that the bridge connects.

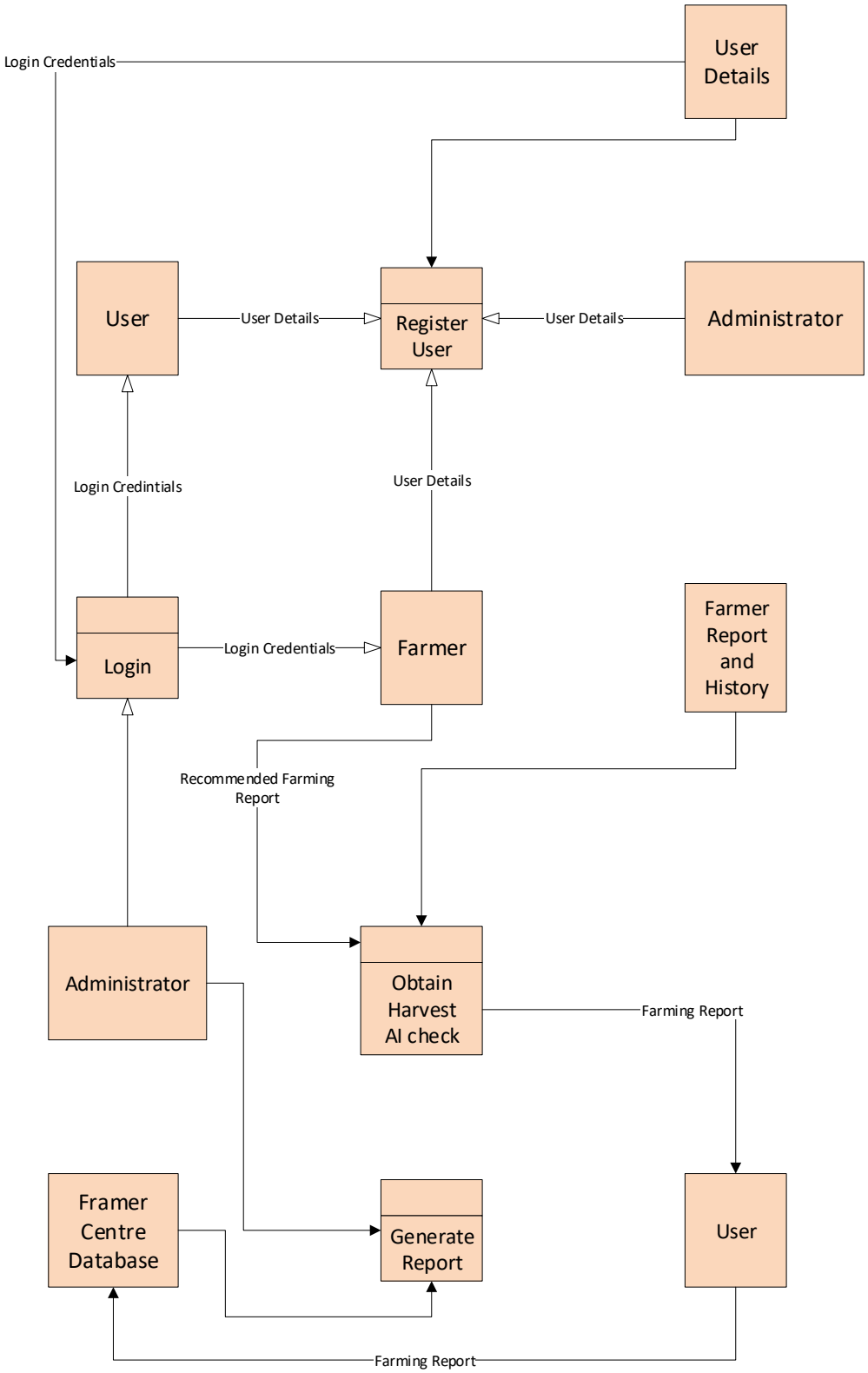
Repeater	• An electronic device that amplifies the signal it receives.
Modem	• They are used to transmit digital signals over analogue telephone lines.

4.9 Data and Database/Files

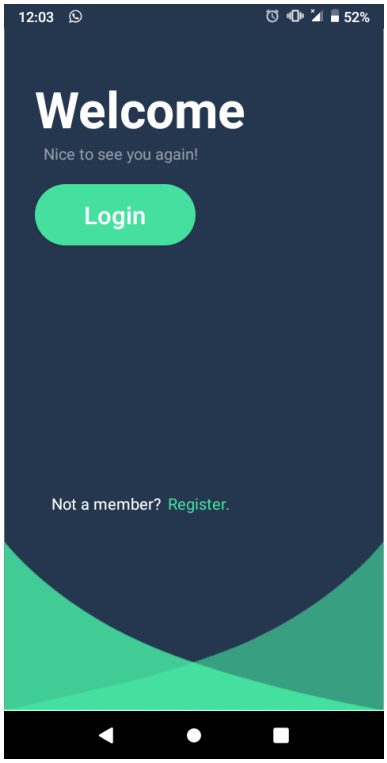
1. Land Report

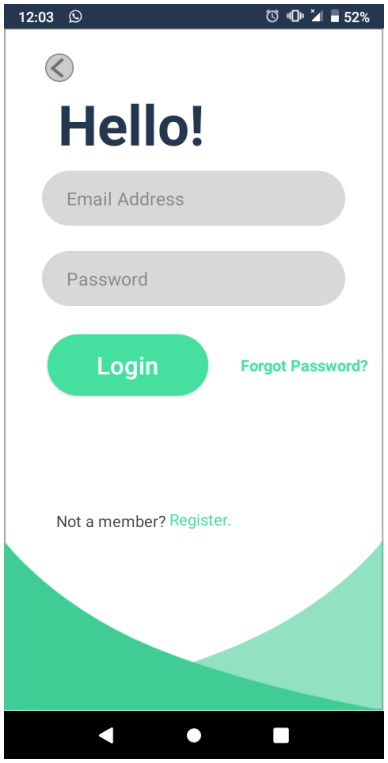
NAME	ID	P.K	VALUE	DESCR	DATA TYPE	LENGTH	ACCEPTABLE VALUE	REQUIRED	ACCEPT NULL VALUES
Land ID	1	1	Land ID	Unique Land ID	Varchar	255	00000000	Y	N
Avg Temp	2		*C	Avg Temp in *C	Double	4	00,00	Y	N
Avg Precipitation	3		Mm	Avg rainfall in mm	Double	4	00,00	Y	N
Soil PH	4		H+	Avg PH record	Double	4	0,00-14-00	Y	N
Date Of Record	5		Date	Date of Record	Date	10	YY-MM-DD	Y	N

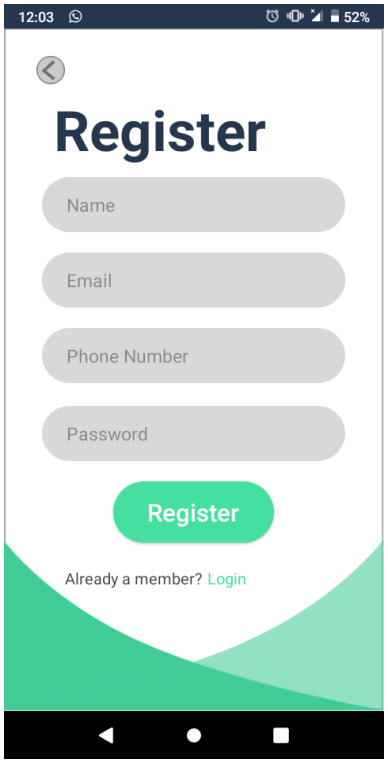
4.10 Dataflow Diagram

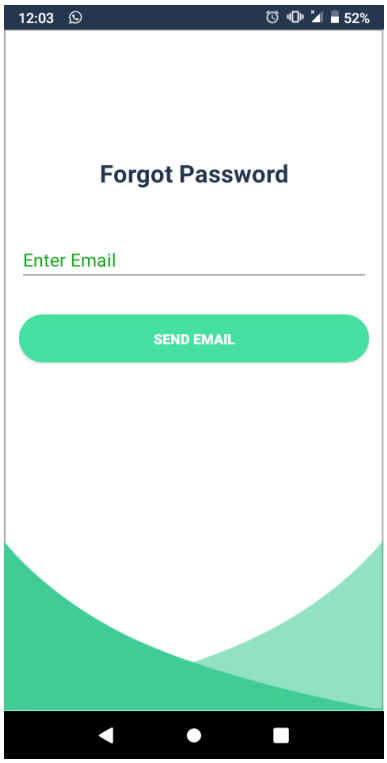


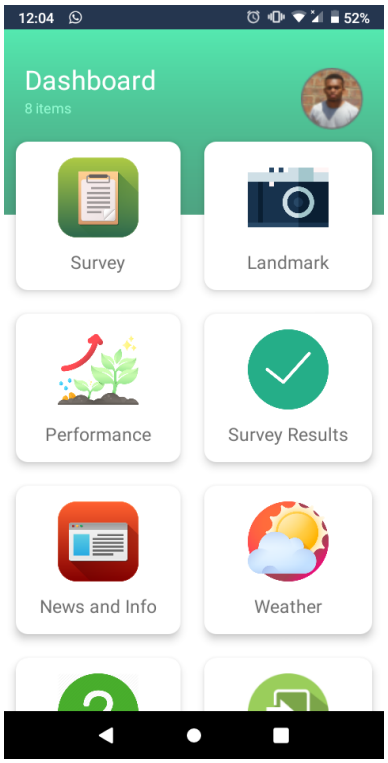
4.11 System Interfaces

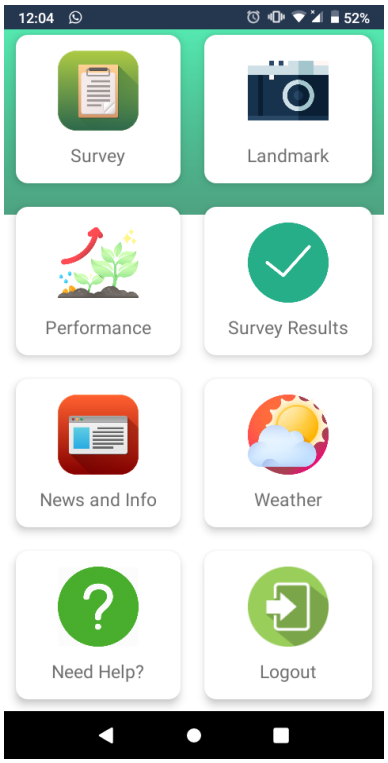


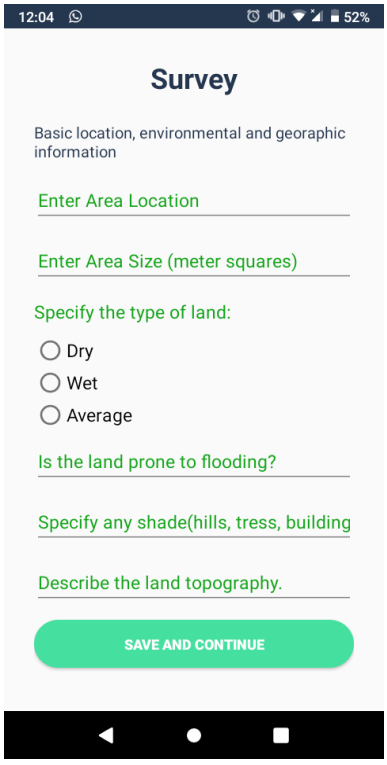


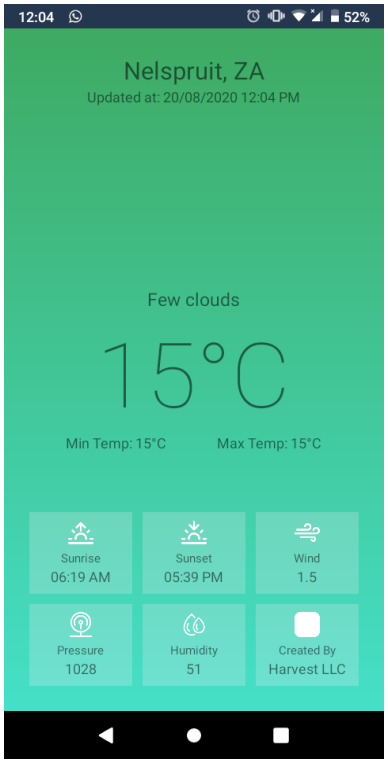


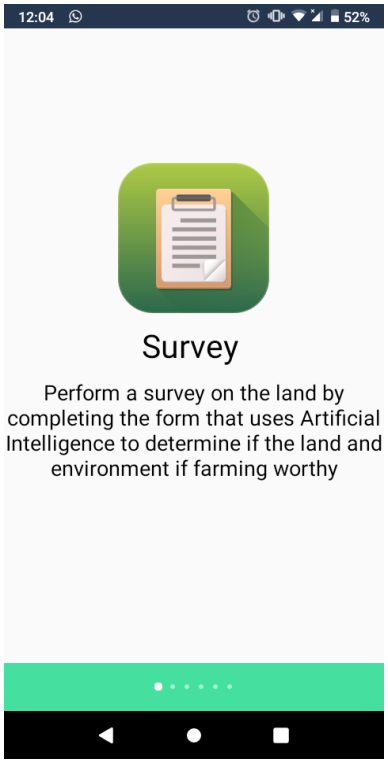


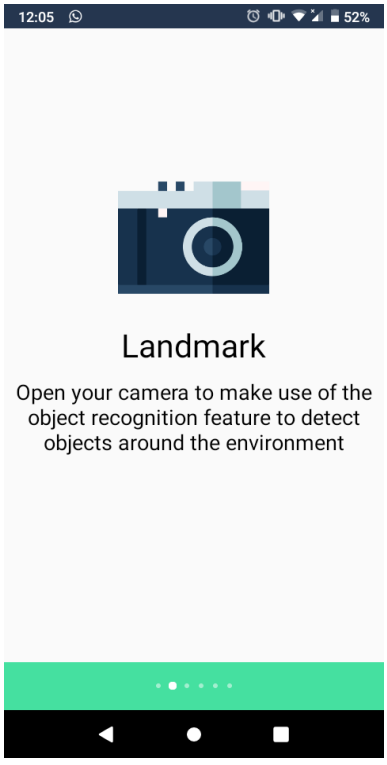





12:04
52%
Survey
Basic location, environmental and georaphic information
Enter Area Location
Enter Area Size (meter squares)
Specify the type of land:
Dry
Wet
Average
Is the land prone to flooding?
Specify any shade(hills, tress, building
Describe the land topography.
SAVE AND CONTINUE


12:04
52%
Nelspruit, ZA
Updated at: 20/08/2020 12:04 PM
Few clouds
15°C
Min Temp: 15°C
Max Temp: 15°C
Sunrise
06:19 AM
Sunset
05:39 PM
Wind
1.5
Pressure
1028
Humidity
51
Created By
Harvest LLC


12:04
52%
Survey
Perform a survey on the land by completing the form that uses Artificial Intelligence to determine if the land and environment if farming worthy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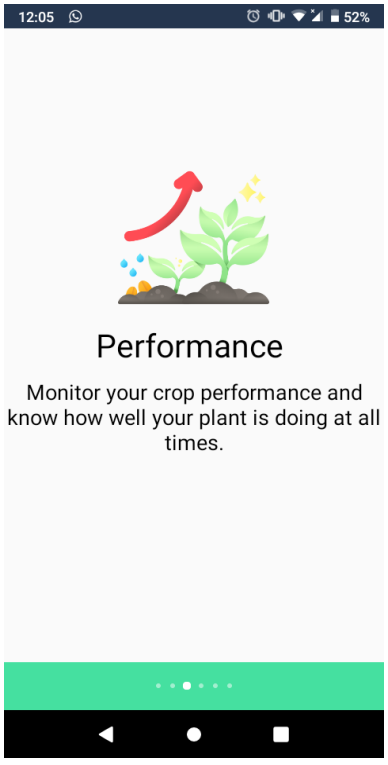
Landmark
Open your camera to make use of the object recognition feature to detect objects around the environment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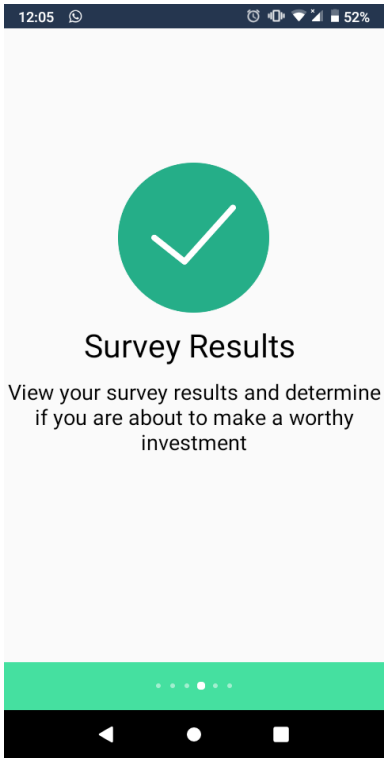
Performance
Monitor your crop performance and know how well your plant is doing at all times.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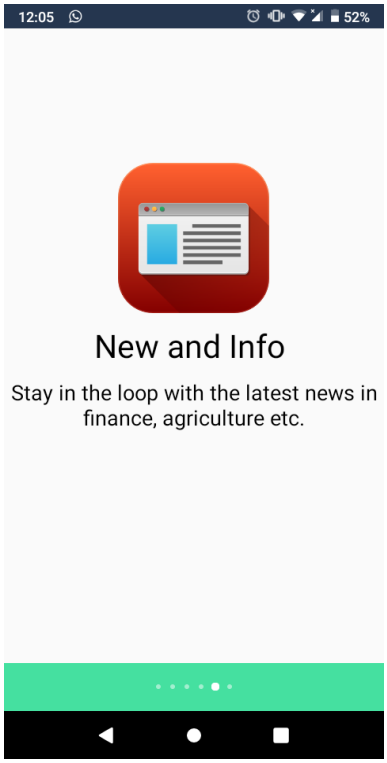
Survey Results
View your survey results and determine if you are about to make a worthy investment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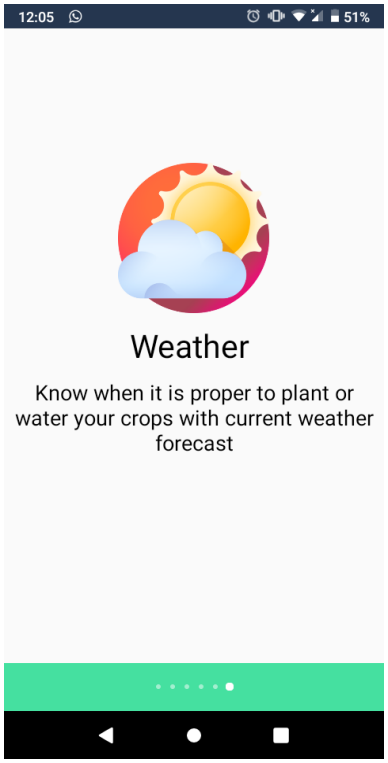
New and Info
Stay in the loop with the latest news in finance, agriculture etc.


12:05
51%
Weather
Know when it is proper to plant or water your crops with current weather forecast