

**AGRIPRENEUR: A MOTIVATIONAL APPLICATION TO
GENERATE ENTREPRENEURS.**

Project ID – 2021-090

Project Proposal Report

Silva S.H.I

Bachelor of Science (Hons) Degree in Information Technology
Specializing in Software Engineering

Department of Computer Science and Software Engineering
Faculty of Computing

Sri Lanka Institute of Information Technology
Sri Lanka

February 2021

**AGRIPRENEUR: A MOTIVATIONAL APPLICATION TO
GENERATE BUSINESSMEN AND ENTREPRENEURS**

Project ID – 2021-090

Project Proposal Report

Silva S.H.I

IT18111170

Supervising by

Dhammika De Silva

Bachelor of Science (Hons) Degree in Information Technology
Specializing in Software Engineering


Faculty of Computing

Sri Lanka Institute of Information Technology
Sri Lanka

February 2021

Declaration

We declare that this is our own work and this proposal does not incorporate without acknowledgement any material previously submitted for a degree or diploma in any other university or Institute of higher learning and to the best of our knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

Name	Student ID	Signature
Silva.S.H.I	IT18111170	

The above candidate is carrying out research for the undergraduate Dissertation under my supervision.

Name of supervisor: Mr. Dammika De Silva

Name of co-supervisor: Ms. Janani Tharmaseelan

Signature of supervisor: _____ Date: _____
(Dammika De Silva)

Signature of co-supervisor: _____ Date: _____
(Janani Tharmaseelan)

ABSTRACT

In past years, if a person wants to become entrepreneur it seems very difficult and hard because of lack of resources and knowledge but in new era entrepreneur resources can be found but anyhow still it seems difficult to find proper resources related to agriculture specially in a country like Sri Lanka. Even if there are resources the people who got the advantage is less amount though they have full of space around their house. Furthermore, In Sri Lanka, people especially afraid of failing when it is a new innovation because there is lack of guidance. People would not have inclined to grow different crops unless they are encouraged, motivate to do so. As a member intend to get more participants to research for make the platform bigger and to make more entrepreneurs

Moving on, this proposed Application provide any individual or family to become proper green entrepreneurs through a proper motivational aspect where user can be stable in financial even in some bad situations. Suggested Application Provides a gamification model to more addict the user through human computer interaction to the Application which also include the reward model which provide them agricultural needs according to results they got. It includes attractive UI, animations which is combined with the psychological aspects of motivated. Application encompasses with a regional leaderboard which show user the other user earned values who are in the same area. it drives the users to gain more profit by motivating user.

Key words: *Motivation, Entrepreneur Agriculture, Gamification, Psychology, IUP, Agripreneur*

TABLE OF CONTENTS

LIST OF FIGURES	v
LIST OF TABLES	vi
LIST OF ABBREVIATIONS	vii
1. INTRODUCTION	11
1.1 Background	11
1.2 Literature Survey.....	13
1.3 Research Gap.....	18
1.4 Research Problem	19
2. OBJECTIVE	21
2.1 Main Objective.....	21
2.2 Specific Objective.....	21
3. METHODOLOGY	22
3.1 System overview.....	22
3.2 Development process.....	23
3.3 Feasibility study.....	24
3.4 Requirements gathering and analysis.....	24
3.5 Design	24
3.6 Implementation.....	25
3.6.1 Gamification model.....	25
3.6.2 Reward Schema.....	25
3.6.3 Leaderboard.....	25
3.6.4 Motivational Factors.....	26
3.7 Integration and Testing.....	26
3.8 Work breakdown structure.....	28
3.9 Gantt Chart.....	29

4. DESCRIPTION OF PERSONAL AND FACILITIES.....	29
4.1 Functional Requirements and Non-functional Requirement.....	
29	
4.1.1 Functional Requirements.....	29
4.1.2 Non-Functional Requirements.....	30
4.2 Technology selection	30
5. CBUDGET AND BUDGET JUSTIFICATION.....	31
6.CONCLUSION.....	32
REFERENCES	33

List of Figures	PAGE
Figure 1.1.1 – Real GDP growth of Agriculture of Sri Lanka	11
Figure 1.1.2 - Bare Land Availability.....	12
Figure 1.1.3 – Average Monthly Family Income.....	12
Figure 3.1.1 – System overview diagram	23
Figure 3.1.2 - Gamification model.....	24
Figure 4.1.1 - WBS.....	14
Figure 5.1.1 - Gantt chart.....	14

List of Tables

Table 3.7.1- Expected Output	27
------------------------------------	----

List of Abbreviation

Abbreviation	Description
IUP	Image Understanding and Processing
GDP	Gross Domestic Products

1. INTRODUCTION

1.1 Background

Economy is one of most important factors when it comes to stability of individual or family. Sri Lanka is a country where people have good agricultural Sanskrit. They can be Economically stable even if they have small amount of space in their garden by managing the spaces wisely while other waste their large amount of space. When country is in bad situation it is possible to sustain by managing the space of their garden. In order to get the best results out of their space they need some motivations which is lack in the country. According to the survey, The GDP growth of agricultural of sri lanka will be shown in here which is from CBSL [pic of decreasing]

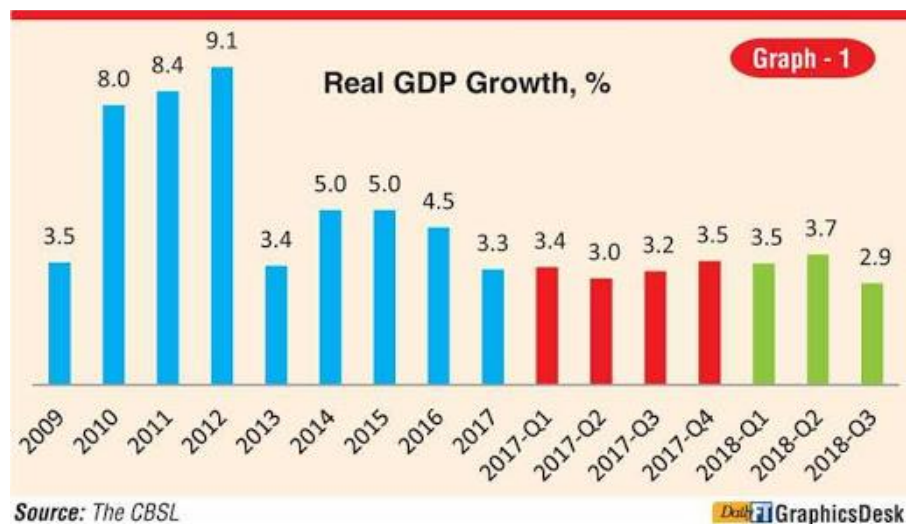


Figure 1.1.1 - Real GDP growth of Agriculture of Sri Lanka

In this graph it illustrates that the growth of GDP of agriculture decreased in years from 2009 to 2018.

In the internet there are motivational research papers can be found which gave good explanations about motivation for agriculture as well as bad. Some papers show it without consider the psychological factors or does not give proper results quite well. Almost all of papers illustrate that attitude of an individuals or family together can

make a big difference. It also shows that attitude difference from regions, gender, age, believes, social pressure, knowledge and many more. Data sets gathered in different methodologies in different regions. in our Application data gathered conduction online form survey and results showed up like this.

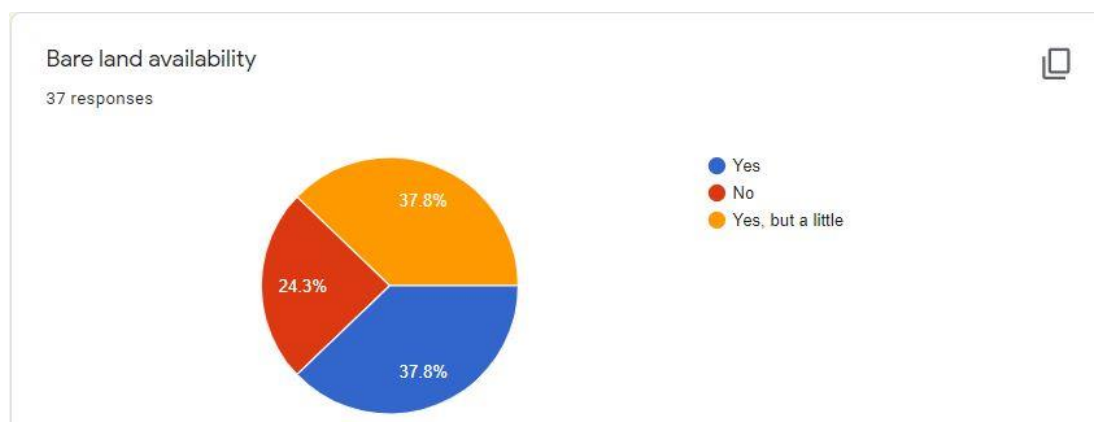


Figure 1.1.2 – Bare Land Availability

Above graph describes the Bare land Availability of the survey. It shows that the less number of people does have small amount of space to grow the crops.

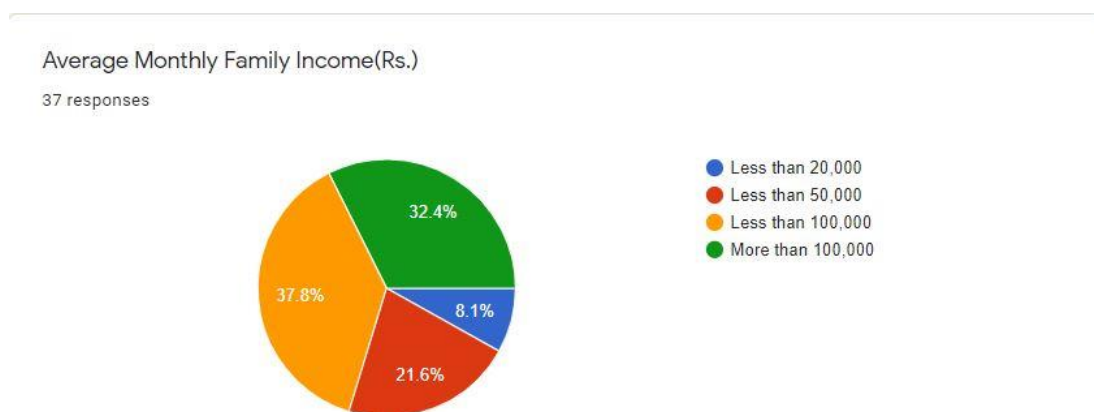


Figure 1.1.3 – Average Monthly Family Income

This graph shows that the average monthly family income of the survey. Which illustrate that the most of participants have monthly income of less than 100,000 which means that most of people have some of considerable sustainable salary.

Furthermore, in our research members engaged more with psychology aspects with motivations and represent it to user with different technological based methodologies. The application is a mobile Application using react native as frontend and python as backend with Restful services. which motivate and engaged users to the system more and through the flow they will motivated to grow the crops and earned money which they will be sustain.

The following parts of the papers will discuss the literature review, research problem, research gap and the other main points want to make attention

The following sections of this report is explaining the literature review of the related researches, research gap and research problems, methodology of the project and the conclusion part which will conclude overall work planning.

1.2 Literature Survey

By reviewing other research papers can acquire more knowledge about the similar functionalities and technologies. Those are knowledge about the research problem, impacts of them and how well they tackled them.

Following Research paper, [1]. Which is about cereal based farming system in Ghana. Research paper shows that motivation of farmers in Ghana depends on three sustainable intensification practices which are improved maize varieties, cropping system strategies and both of them together also include depends on personal satisfaction, eco-diversity and eco-efficiency which are differed in regions. They clearly mention the regions directly effects the farmers to motivate to grow crops by representing graphs and percentage values of different regions calculated using different equations. Paper mention that lack of social support, climate changes, risk

and uncertainty, policies and regulations are some facts that occurred in Ghana to demotivate people in Ghana. Some of farmers focused about the crop diversity, nutritional benefits they gathered, some focused about the self-efficiency rather than economics.

Following research [2] conduct in 2013 with people who are farmers involved in pasta supply chain. To evaluate farmers' intention and implements of sustainability of approaches related to ecological area with wheat crops according to the agricultural policies and it shows that farmers have low level of knowledge of common agricultural policy when conducting questionnaire. farmers' attitude directly impacts the sustainable ecological area with data set collected from survey in Italy. Somehow some farmers do not believe that agricultural policies will not make any difference at all which represent in graphs and tables. They have used statistical technological approach which used different methodologies to conduct research

When consider the psychological aspects of people related to agriculture it shows that the motivation depends on the gender as well. Which is properly shows in This research paper [3] it shows that female farmers more motivated for quality seed than male farmers this consider under six attributes "good taste," "drought tolerance," "long shelf life," "resistance to diseases," "big tubers," and "high yield." Papers also mention that female users are not mentally inclined to waste the money for family purposes they are enjoyed when they eat. When it comes to male farmers, they consider the early maturity as a key characteristic when selecting quality seeds. Research conduct potato farmers in six districts in Kenya with different methodologies including interviews

When it comes to gamification, there on the internet less number of researches can be found. Somehow there is a huge impact for user when using a gamification model-based approach. But in following paper [4] didn't clearly say that its success or fail it mention that success partially. Papers is conduct in Indonesia in rural areas. The

purpose of the paper is to increase communication and farmers to motivated to engaged more in agriculture because the population for agriculture area drastically reduced. They have conduct using methodological way but didn't mention the percentages of participants or the results. They mention represent graphs including gaming elements and UI but in general way hoping to engage more users to the system. They mention they have included leaderboard and reward setup for the Application to engaged more users. Which leaderboard show people with the highest values person in top and they won reward according to the rank they achieved

Research paper [5] shows that they have changed the previous methodologies of plan breeding by using the gamification model. The objectives of research are to provide ease way to improve participatory with less limited resources which lead to success. It is full of interactive fun activities. It is a card game model which has pairwise ranking of traits. They have collected data in 9 rural communities in Germany which took place in November to December 2014. They have clearly illustrated the percentages of participants with complex formulas. They used Bradley-Terry model to analyze the data which is provide by the Application

There is research [6] which shows the impact of motivation of farmers when they take decision making on technologies. The research purpose is to understand why there is a difference is technology adoptions in Sri lanka and Czech Republic. Relationship of intention-behavior with other behavior types. This does not show Application approach for motivation. Data collect from both countries and data analysis done using regression analysis. They have calculated and participants' overall results using mathematical statistical formulas. The results show by using the tables with the percentages values which is measured by Cronbach alphas methodologies. Research paper illustrates that attitude is a main characteristic of Czech Republic farmers has where in Sri lanka understandable Behavior controls with attitude. Social pressure can be effect to sri lanka farmers as well. They have showed the limitation for the study which discuss about the questionnaire They mention it should be not clearly what might have asked from them and the sample size is better when it is large where they have considered small number of participants.

when it comes to sri lanka, the mindset would be same. Most Sri Lankan farmers motivated by the attitudes they got. Farming experience educational knowledge will determine the attitudes of farmers except age gender or farmland. Research [7] has been conducted in Badulla district in Uva Province and data collected through questionnaire survey by individual farmers. It illustrates that 91% of farmers have farming experience and there are 90% of farmers whose age is above 30 years. Majority of them are educated up to Ordinary Level or above levels. It shows that experience of farmer gained by the opportunity, risk taking. The purpose of having the research is to investigate upcountry farmers of their entrepreneurial attitudes. How it effects. The facts considered is the innovation, opportunities seeking and obtaining risk

Furthermore, the research Paper [8] shows that two major farmers can be found. One who motivated by sharing details and contributing to scientific research and others are motivated by community factors. These categorizations have been made by conducting questionnaire, 426 face to face interviews in different communities of farmers from countries in different continents in 2014, 2015. countries are India, Ethiopia and Honduras. The purpose of the papers is to farmers' motivation to participate in citizen scientist project and the farmers' mobile phone usage. Principal Component Analysis methodology used to group farmers according to their motivation. They have used different successful methodologies to analyzed as well they represent analyzed values using graphs and figures. They have also mention that the country background and the education level characteristic will affect the farmers' motivations on Agriculture overall 20%. They have illustrated that the gamification will increase the egoistic intrinsic motivation of farmers. Which means the information sharing mindset farmers and the community interaction mindset farmers.

When it comes to entrepreneurship of agriculture, there is a Russian research paper [9] about Indian agriculture which shows the motivation policies of agricultural entrepreneurship. Research paper illustrate that motivation policies effectiveness will be decreased because of the lack of attention to the different entrepreneurs' types. They

have mention that there are hereditary and non-hereditary entrepreneurs were there and It says that non-hereditary communities including early retirement groups have greater decision-making skill and contributing greater to rural development of agriculture. Their aim to develop Decision theory in agriculture motivation and debasing. In different entities, the reason for differentiation of non-hereditary and hereditary is that they have different number of alternative methodologies. They have used more reference than any other reviews to show that the methodologies they implemented. They criticize the existing agriculture entrepreneurs' classifications. They have used graphs, diagrams, tables and different formulas to show the methodologies and workflow of project.

The following research paper [10] discussed about the socio-psychological aspects of small holder farmers would have faced to maintain successful agriculture. They have mention adoption of land management practices in dryland and water stressed lands according to the socio-psychological factors. They have collected 350 random small hold farmers for the questionnaire. Mainly Multivariate probit model has been used to investigate the factors as well as to identify and analyzed land management practices adoption. Finding shows that the practices have been used to increase the productivity of crops, Soil fertility and water retention capacity. They have mention that farmers used agroforestry system, compost or crop-rotation to increase the productivity. The research illustrates that the education, information, attitudes, group membership effect the adoption of socio-psychological aspects of land management practices.

They used equation and used mathematical terms to maximize the effort of the studies as well as the probability included in the research paper also used graphs and diagrams to illustrate what they have been done so far for the agriculture.

There is a research papers[10] in nutshell it describes the risk for farmers which also have been slightly discussed in above research paper. This following research paper try to illustrate the overall risk for farmers the attitudes for these factors to happen. Which is take part in Ethiopian agriculture. They have mention that they collected data from cross-sectional survey. They mention that natural hazards, input output price

volatility, technological risk, financial shocks and human security are main resources for the risk in agriculture in Ethiopia. They have divided farmers into 3 sections according to the risk. The finding shows that the farmers who have educational knowledge, strong capital who have received training are less risk also this shows that specific farmers should be provided more attention to awareness of agriculture, build adaptive capacity to shock hazard, get them up-to-date information and improve skill and knowledge.

Study conducted in six villages in northern Ethiopia, and they have mentioned the temperature of the land they encountered. They have done analysis using probability and statistical way and get the details using different mathematical methods and equations which are complex. Anyhow they have used less graphs but include many tables and reference to prove the quality of the research they conduct.

There is a research based on India [11] which discusses about the psychological constructs towards the agricultural technological adaptation. They have conducted the research using of planned behavior. The behaviors based on the Attitude, Subjective Norm, perceived behaviors. They have used 731 farmers from India. It has been taken place in placed call mini-kites. From the research they have found that Educated farmers are more likely to adopt the technologies less educated people are not like to adopt technologies even though it is helpful for them. They have also adopted the Swarna sub adoption model for rice crops other than planned behavior. They have mention that It is important to investigate farmers to inclined more technological adoption.

They have shown the results of regression analysis testing and the conducted workflow as well. They did not mention any other mathematical equations as well as calculations on the collected data. They have mentioned that this is a new research are to discuss and there is a possibility that the results may slightly differ.

1.3 Research Gap

Our research idea and methodologies of motivation individuals and families and make them sustainable in economy are pretty much new approach for agriculture because motivation through mobile Application to individuals or families in agriculture area papers would not be found.

There are some existing gamification models in agriculture area, but it illustrates the farmers' participation to the plan breeding [5] which include the card game with fun activity. The purpose of the paper is about to create easy method to implemented by non-academic members and with limited resources. Still paper has some limitations to the system they need to reduce training need for participation. Papers is about participation attribute of farmers of plant breeding. Local adaption by non-specialist members are some of them anyhow. Their research does not conduct under the psychological aspects of farmers. And the purpose of the research to participation to the plant breeding. Our research is about to motivate throughout the whole process not only participation with including the psychological aspects through mobile phone App. They have used card game for the gamification model instead our research uses image processing and understanding to motivate user.

Research paper [4] it has the same kind of approach, but it is related to increase of engaged more user to system not to motivate them throughout the project also it is focused on the improvement of farmers' communication between them and professionals. They have also implemented gamification model including rules feedbacks where in our project we include image-based values feedbacks. When it comes to rewards, they provide virtual rewards where our rewards are more like real objects which helps to users

1.4 Research Problem

The proposed Application is about to make users motivated to engaged more on agriculture works even they have less amount of space anyhow there are several papers can be found which do not provide proper solution for motivation.

If individual person or family have enough space for agriculture works, they would not have inclined to make it happen because they do not have motivations to do. Less of them know the advantages and benefits they gathered. So, their valued empty space will waste for nothing while some people in sri lanka wish for more spaces even sri lanka has the cultural behavior for agriculture. for the Covid Pandemic some people faced bad situation without having money which we can be seen on Television. Some people not motivated for growing while in the pandemic even they have enough of spaces for agriculture works. That's why because of their lack of knowledge of what the benefits they gathered can be economically sustainable. Their earned money can be used for daily household items. They can manage benefits as their preference

Furthermore, some research papers [4] implemented the gamification model for agriculture though it does not go well. It does not focus the psychological aspects of how human thinks, how they feel about the Application which effect the motivation and gamification models as well. Proposed Application focus to implement gamification model in different way using images. Those research papers they did not concern about the market value analysis for the crops they grow.

It is necessary to overcome this problem. Suggested Application provide solution for above problem and implement best system for Agripreneurs

.

2.OBJECTIVES

2.1 Main Objective

Main objective of this paper is to motivate the end-users to engaged the platform and motivate other users by gaining the benefits through the application. Which is continue by the motivated and including different psychology aspects by using specific interfaces for the system. Users keep motivated until they sustainable in economically.

2.2 Specific Objectives

1. Create Gamification Model

Creating a model to engaged user more with the Application and also include the reward Schema implementation where user can have related Agricultural rewards.

2. Create regional leaderboard.

Creating a regional leaderboard where it shows the list of users of same area with the details according to their growth crops which is a result of the motivated output,

3.METHODOLOGY

3.1 System Overview Diagram

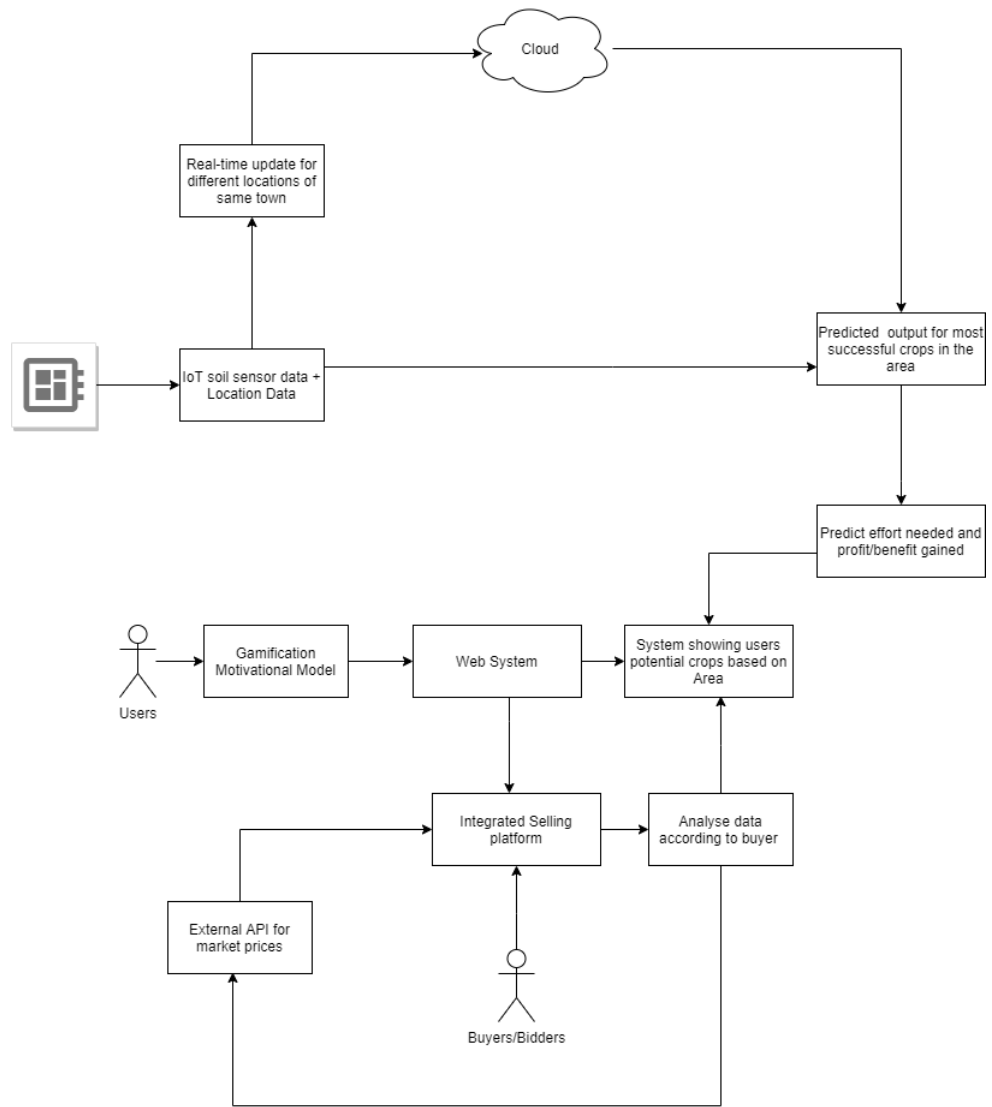


Figure 3.1.1: System overview diagram

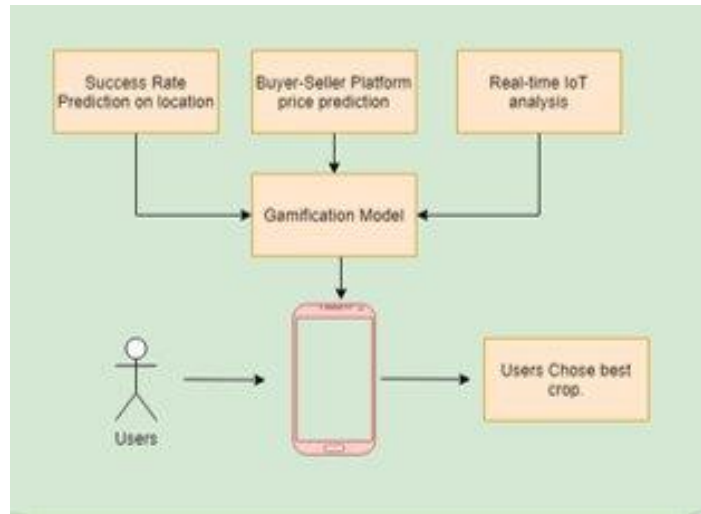


Figure 3.1.2: Gamification Model

3.2 Development process

Iteration model including agile methodology is better in this project because the requirements slightly might be changed. Agile scrum methodology always accepts the changes well.

In Iteration model. It undergoes with different stages while it is iterating which are requirements gathering, design, implementation and testing phase. Why selecting this model is,

- The requirements are defined but it slightly changed so agile methodology is needed. Agile methodology can accept changes and work well.
- In project development new technologies can be introduced so process should be iterative if changes fail it should iterate to previous phase and redo it

Agile Scrum methodologies used with many sprints for better implementation of project accepting the changes well. Trello project management tool will be cooperated for managing the project task well.

3.3 Feasibility Study

Feasibility should have considered when starting at project. For motivation purposes it is feasible it does not spent money for the reward we reduce discount for users. For leaderboard it is feasible. For the gamification model there is no need of specific equipment to buy therefore feasible in economy wise. It is feasible in technology as well there are enough technologies methodologies in IUP. OpenCV is an open-source library it used with python language. Which are feasible in technology as well as economy.

3.4 Requirements gathering and analysis.

As a research we have conducted an online survey using google form to get an idea of urban families mainly in Gampaha and Colombo district. By conducting we gathered the information related to their spare time, monthly income and expenditure including the bare land available to them.

Perform gamification model user capable of interact with the camera featured smart phone It is the main requirement for gamification model. In urban area like Colombo most people have that feature. For leaderboard and reward schema there is a need of users' engagement of the proposed platform.

There is a need of crop success ratio predict on location, buyer seller platform price prediction as well as the real-time IOT analyzed values for the gamification model.

3.5 Design

Mainly focused on the User interfaces designing of proposed application using tools for better use of application and including motivational aspects. Application provides higher user experience and easy navigation and interactive feeling of usage within the components.

Prototyping of the application will be considered in this stage. Advanced ER diagrams and class diagrams will be considered as well. Purpose of this stage is to be considering above aspects to build the better design for the application.

3.6 Implementation

Main functionalities will be considered here. Image processing model will result the best crop to select for the uploaded image. By performing Image enhancement and detection process it will provide best results. Leaderboard will be implemented. Which takes place after the crop is selected and the reward schema will be implemented. It mentions as below.

3.6.1 Gamification methodology

It is a model based on IUP and it provides user to get the picture of the land and it will estimate the money can be earned. It also includes the psychological aspects that will motivate users the elements of UI and animations can be seen there. Using IUP it will process the land space and calculate area and estimate the money can earn.

3.6.2 Reward Schema

It is a schema that provides the rewards for the users which they will motivate by having it. It is a reward related to Agriculture. There are several rewards which is given to user according to the rank and point they earned. Hope to deliver the reward to them in real world.

3.6.3 Leaderboard

It will show the regional leader board where users can see their progress according to their motivation gained. I will show the rest of users of same area with the points they earned also include the Rank of users as well. Which include attractive UI animations to get the users attention considering the psychological factors.

3.6.4 Motivational Factors

This is the main part of the research. When it comes to motivation all above mention section included with the motivational factors. Paper considers the how human thinks their attractions, attentions and their behaviors. In Application decide to include different UI for attraction, animations to motivate end-users.

3.7 Integration and Testing

Testing is most important in the field of Software to identify and recover the defects of the system. Testing is conducting in every phase of lifecycle from the beginning. Testing includes integration testing, unit testing, system testing and user acceptance testing.

Integration testing is most important because in gamification model 4 major components will be integrated and show it as once. Unit testing can be done easily it perform the developers for unit. Once the entire system builds and tested it will give to test by users which also called user acceptance testing. All testing performed above it need for system to be available and work fine.

Expected Output In nutshell,

Expected Model	Expected outcome
Gamification Model	User interacts with the model. It provides best crop according to data analyzed.
Leaderboard Model	It provides Regional leaderboard where user can see the rankings.
Reward schema Model	It provides Discounts on taxes according to the rank user obtain.

Figure 3.7.1: Expected output

3.8 Work breakdown structure

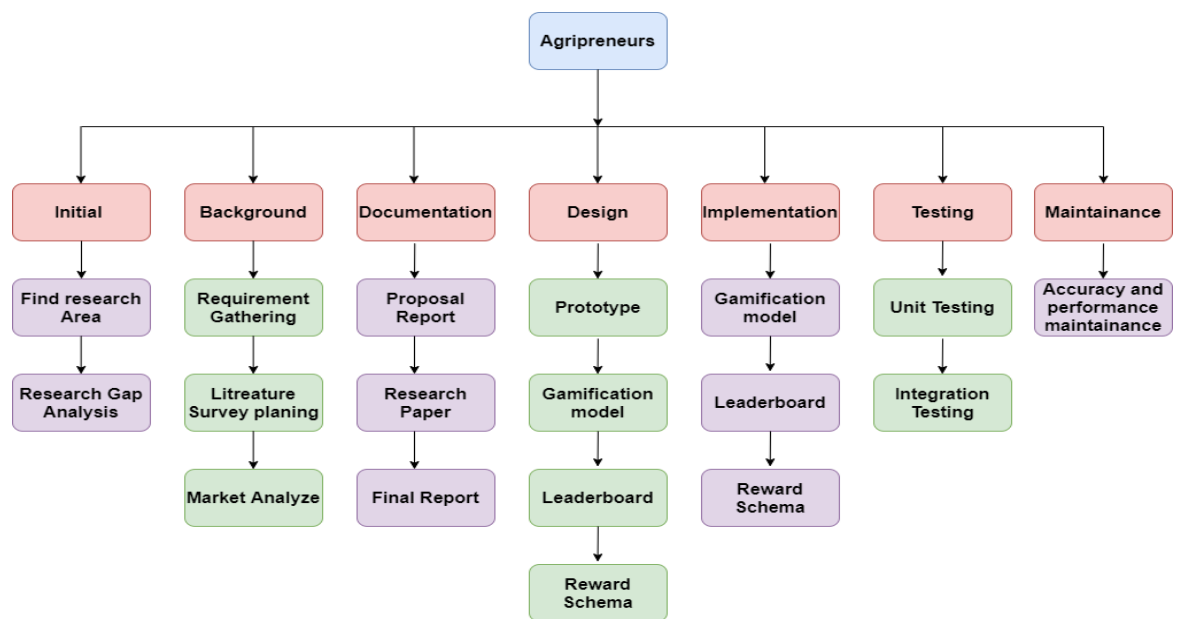


Figure 4.1.1: WBS

3.9.Gantt Chart

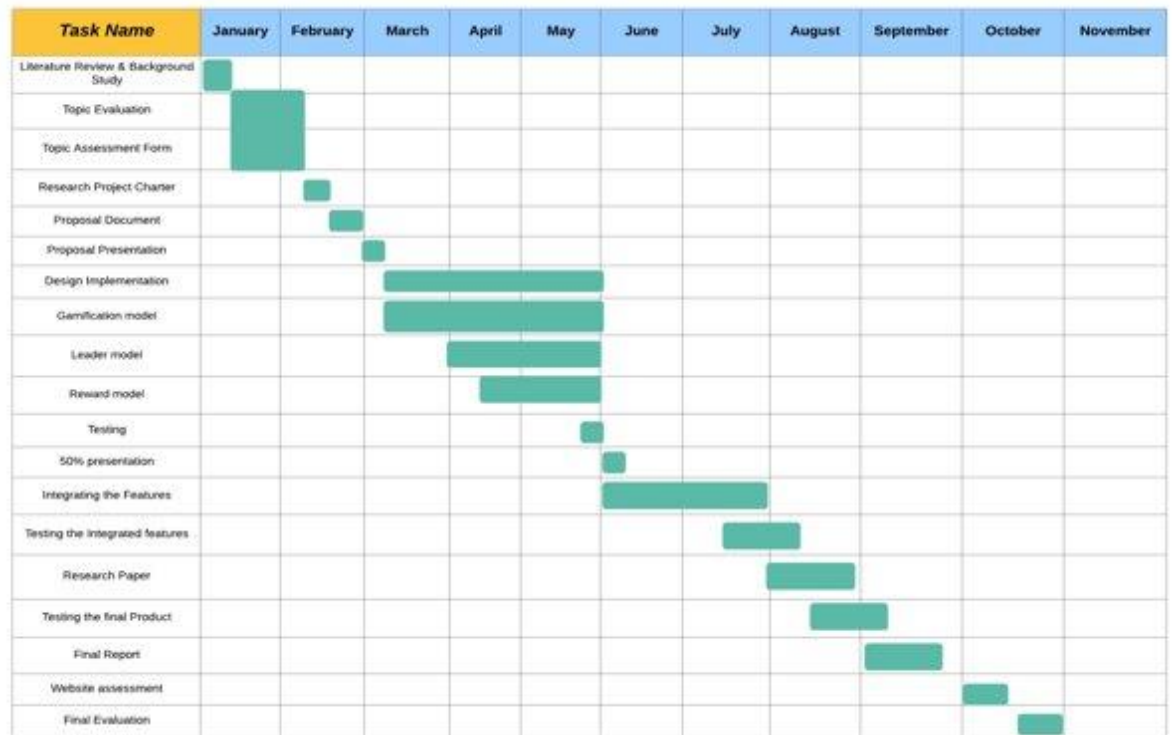


Figure 5.1.1: Gantt Chart

4. PDESCRIPTION OF PERSONAL AND FACILITIES

4.1 Functional Requirements and Non-Functional Requirements

4.1.1 Functional Requirements

For the gamification model there are requirements needed. The results of IOT analyzed details of soil conditions need and as well as the Buyer-seller platform price predicted results and Success ratio prediction of location will be requirements of the gamification model.

For the regional leaderboard price, they have earned from the crop will a requirement and for the reward schema the entrepreneurs ranking will be and requirement. Camera featured smart phone will be a requirement to get the land image for gamification model. Those will be the main requirements for the model

4.1.2 Non-Functional Requirements

Sd For Non-Functional requirements Availability, reliability, performance, usability, accessibility, maintainability will be considered in this section. With the integration of cloud platform, it maintains the availability of the Application, where user can log anywhere anytime. Reliability is an effect of availability when considered the reliability the Application should provide sustainable operational over time. Application guarantee to provide best responsiveness of interacting with the system it depends on the cloud platform and the how the application handle the request from servers. Usability is the main nonfunctional requirement should consider in the Application. Application needs to meet the users expected outcome of the system as well it provides user satisfying functions and UI to interact with the application. Maintainability reflects from developers' side code and logic should be maintainable for better future.

4.2 Technology and Tool selection

Technologies

- Image Understanding
- Image Processing
- React Native
- Firebase
- Python-Django

Tools

- For mobile Application Development – React Native, Python
- For Gamification – OpenCV
- Virtual Emulators Android
- MySQL server management studio/Workbench

5. BUDGET AND BUDGET JUSTIFICATION

When it comes to Budget and justification, from users perspective generally there will be a charge of Application from entrepreneurs, but purposed application has reward schema model there expected to cut off 10% of the charge according to the rank they obtain in the regional leaderboard. Purpose of having this 10% cut off for the motivation of entrepreneurs to grow more crops.

From developer's perspective, the budget goes for the cloud computing resources. It will cost according to the instance created time it is activated, and resources encountered. That will be the main buget for developers.

5. CONCLUSION

This research project is about the motivated the users to grow crops and make them sustainable in economically. Project is managed by the psychological aspects. Project include gamification model to engaged user more in to the system with IUP based technologies including reward schema and leaderboard.

In the project lifetime of one year, first 5-6 months is to finish the design implementation of gamification model And the rest of the months are scheduled for research and integrate the psychology aspects.

Reference

- [1] S. Mellon-Bedi, K. Descheemaeker, B. Hundie-Kotu, S. Frimpong, and J. C. J. Groot, “Motivational factors influencing farming practices in northern Ghana,” *NJAS - Wageningen J. Life Sci.*, vol. 92, no. June 2018, p. 100326, 2020, doi: 10.1016/j.njas.2020.100326.
- [2] D. Menozzi, M. Fioravanzi, and M. Donati, “Farmer’s motivation to adopt sustainable agricultural practices,” *Bio-based Appl. Econ.*, vol. 4, no. 2, pp. 125–147, 2015, doi: 10.13128/BAE-14776.
- [3] J. Okello, Y. Zhou, I. Barker, and E. Schulte-Geldermann, “Motivations and Mental Models Associated with Smallholder Farmers’ Adoption of Improved Agricultural Technology: Evidence from Use of Quality Seed Potato in Kenya,” *Eur. J. Dev. Res.*, vol. 31, no. 2, pp. 271–292, 2019, doi: 10.1057/s41287-018-0152-5.
- [4] I. Nuritha, V. P. Widartha, and S. Bukhori, “Designing gamification on Social Agriculture (SociAg) application to increase end-user engagement,” *Proc. 2017 4th Int. Conf. Comput. Appl. Inf. Process. Technol. CAIPT 2017*, vol. 2018-January, pp. 1–5, 2018, doi: 10.1109/CAIPT.2017.8320713.
- [5] J. Steinke and J. van Etten, “Gamification of farmer-participatory priority setting in plant breeding: Design and validation of ‘AgroDuos,’” *J. Crop Improv.*, vol. 31, no. 3, pp. 356–378, 2017, doi: 10.1080/15427528.2017.1303801.

- [6] C. S. Herath, "The impact of motivation on farmers decision making on technology adoption with reference to Sri Lanka and the Czech Republic," *Knowl. Manag. Innov. A Bus. Compet. Edge Perspect. - Proc. 15th Int. Bus. Inf. Manag. Assoc. Conf. IBIMA 2010*, vol. 2, no. November 2010, pp. 790–801, 2010.
- [7] H. S. R. Rosairo and D. J. Potts, "A study on entrepreneurial attitudes of upcountry vegetable farmers in Sri Lanka," *J. Agribus. Dev. Emerg. Econ.*, vol. 6, no. 1, pp. 39–58, 2016, doi: 10.1108/JADEE-07-2014-0024.
- [8] E. Beza *et al.*, "What are the prospects for citizen science in agriculture? Evidence from three continents on motivation and mobile telephone use of resource-poor farmers," *PLoS One*, vol. 12, no. 5, pp. 1–26, 2017, doi: 10.1371/journal.pone.0175700.
- [9] N. Dobryagina, "Agricultural Entrepreneurship Motivation Policies: European Union Experience and Decision Theory Application," *Int. J. Rural Manag.*, vol. 15, no. 1, pp. 97–115, 2019, doi: 10.1177/0973005219834739.
- [10] Zeweld, W., Van Huylbroeck, G., Tesfay, G., & Speelman, S. (2019). Impacts of socio-psychological factors on smallholder farmers' risk attitudes: empirical evidence and implications. *Agrekon*, 58(2), 253–279. <https://doi.org/10.1080/03031853.2019.1570284>
- [11] Yamano, T., Rajendran, S., & Malabayabas, M. (2013). Psychological Constructs toward Agricultural Technology Adoption: Evidence from Eastern India. 87th Annual Conference of the Agricultural Economics Society, University of Warwick, United Kingdom, May 2014, 1–31.

http://ageconsearch.umn.edu/record/158867/files/Yamano_Rajendran_Malabayabas2013.pdf